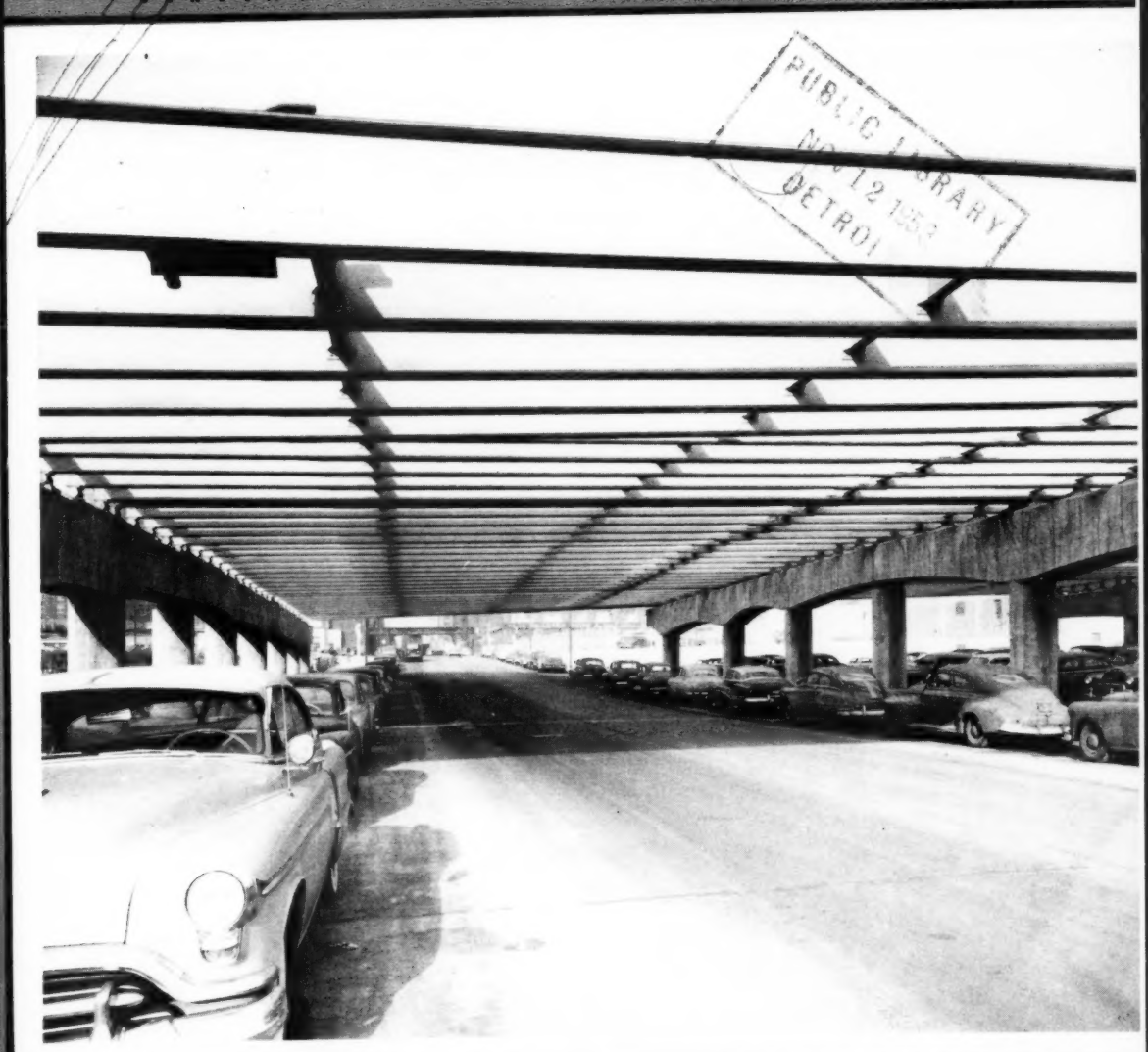
Midwest Engineer

SERVING THE ENGINEERING PROFESSION



WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

Vol. 6 NOVEMBER, 1953 No. 6

a good advertising medium

FOR ALERT ADVERTISERS

Midwest Engineer

because . . .

- Circulation in America's industrial and residential heart.
- The direct path to specifying, purchasing, and industrial executives—those who say yes.
- Provides coverage in all engineered industries.
- Opens a live market area for machinery, fabricated products, industrial equipment, materials of construction, parts, tools, products and services.
- The mirror of the coordination of engineering and civic interests.
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Western Society of Engineers

84 E. Randolph Street
Chicago 1, Illinois

MIDWEST ENGINEER
Published Monthly
BY
THE WESTERN
SOCIETY OF ENGINEERS
AT
2207 DODGE AVENUE
EVANSTON, ILLINOIS

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GENERAL AND EDITORIAL OFFICES
HEADQUARTERS OF
WESTERN SOCIETY OF ENGINEERS
84 E. RANDOLPH STREET
CHICAGO 1, ILLINOIS
TELEPHONE: RANDOLPH 6-1736

The Society does not assume responsibility for statements and opinions in articles, papers and discussions appearing herein. All material must be submitted on or before the 10th of the month prior to date of publication.

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Single Copy .....$ .50
Annual subscription 4.00
Foreign subscription..... 6.00

Entered as second-class matter September 23, 1948 at the post office at Evanston, Illinois under the Act of March 3, 1879.

Midwest Engineer

A Publication of the

WESTERN SOCIETY OF ENGINEERS

Serving the Engineering Profession

NOVEMBER, 1953 Vol. 6, No. 6

CONTENTS

COVER STORY

The picture on this issue's cover shows some of the columns that will carry the weight of the superhighway now abuilding in Chicago. The view of the reinforced piers and girders which support the steel stringers on which the concrete decks of the expressways will be laid, was taken on South Desplaines street. The camera was looking towards the north.

November 9, General Meeting

Speaker: C. E. Bauman, chief electrical engineer, Harza Engineer Company.

Subject: "An Engineer's Observations Around the World." Mr. Bauman at this meeting will give his viewpoint of the world, the product of his extensive world travels.

November 10, Invention Seminar

Note: This meeting will be held in the Grand Ballroom of the Sheraton Hotel in Chicago, from 12 noon to 4:30 p.m.

Principal speaker: Lt. General Leslie R. Groves, USA (Ret.), vice president, Remington-Rand, Inc.

Subject: "What Inventions Mean to You."

This seminar is sponsored by the Illinois Manufacturers' Association and the National Association of Manufacturers in cooperation with the Western Society, and several other societies and universities.

November 11, There will be no Luncheon Meeting—Armistice Day

November 18, Communications Section

Speaker: George A. Trapp, division manager of private wire services, Western Union Telegraph Company.

Subject: "Facsimile—The Modern Method of Communications." The newest types of Telefax equipment will be demonstrated and discussed. This will include the Intrafax System, which provides facsimile communications for intra-company use by many large corporations.

November 18, Noon Luncheon Meeting

Speaker: C. E. Lovewell, service engineer, Chicago Fly Ash Company.

Subject: "Hungry Horse Eats Fly Ash." This interesting talk will cover applications of Chicago fly ash in concrete, with particular reference to the construction of the Hungry Horse Dam. Three-dimension slides in color will be used.

November 19, Gas Fuels and Combustion Section

Speaker: John P. Clennon, senior engineer, The Peoples Gas Light and Coke Company, Chicago.

Subject: "Gas Distribution Network Analyzer." Mr. Clennon will discuss the Network Analyzer or Analog Computer which is installed at the Peoples Gas Light and Coke Company. He will explain how the Analyzer is used in the task of supplying gas to the city of Chicago. He will use slides to illustrate his talk.

November 23, General Meeting

Speaker: J. de Navarre Macomb, Jr., Inland Steel Company.

Subject: "Engineering Adventure at Steep Rock." Inland Steel and the Canadian government are jointly developing the $50,000,000 project to remove iron ore from Steep Rock Lake. The mine is located approximately 150 miles north of Duluth and 75 miles east of International Falls. Test drillings indicate at least 50 million tons of ore in the area leased by Inland Steel.

November 25, Noon Luncheon Meeting

Speaker and subject: to be announced.

December 8, Bridge and Structural Engineering Section

Speaker: Dr. Ralph B. Peck, assistant professor of soil mechanics, University of Illinois.

Subject: "Stability of Bridge Abutments on Clay." Dr. Peck is the coauthor of a book on soil mechanics, and has had a great deal of experience along that line. He will use slides to illustrate his talk.

New Program Policy

The program this year will consist of General Meetings held on the second and fourth Monday evenings of each month, and section meetings on alternate weeks. General meetings only will be scheduled on Monday evenings. These General meetings, not sponsored by any section, will be arranged by a general program committee. Speakers for these meetings will be nationally prominent, and subject matter will be of general interest to all Society members.

Section meetings, scheduled on alternate weeks from the General meetings, will be held on either Tuesday, Wednesday, Thursday, or Friday evening. A specific section will sponsor each of these meetings, also each Wednesday noon luncheon meeting. The subject matter of the Section meetings will be of a higher order of technical interest in the specific field of the section. Luncheon meetings will be of general interest.

Their Development

Iron Ore Deposits in Venezuela

By W. W. Wanamaker

In 1944, Mr. John G. Munson, vice president of the United States Steel Corporation, and in charge of raw materials, with the support of Mr. Benjamin F. Fairless, president, and Mr. B. H. Lawrence, vice president, engineering, initiated a survey of the iron ore resources available to the Corporation. It was apparent that the First and Second World Wars had used the most easily mineable iron ores at an unprecedented rate, and that there was urgent need for an investigation of the economical advantages of developing other possible reserves, both in the United States and abroad.

In connection with the search for new ore deposits, geologists and engineers were sent to many parts of the world, including the Caribbean area, Mexico, Central America, Labrador, Newfoundland, Alaska, British Columbia, Sweden, Africa, and Brazil.

In 1945, Mr. Mack C. Lake, now president of the United States Steel's Orinoco Mining Company, and a long-time M. A. Hanna Company geologist, was engaged by the Oliver Iron Mining Company, a subsidiary of United States Steel, to supervise the examination and exploration of the iron ore deposits of Venezuela. Mr. Lake established his office at Ciudad Bolivar, Venezuela, and after the Company had obtained permission from the Government, initiated a systematic survey of a region 80 by 200 miles in area. The area first explored lies south of the Orinoco River and east of the Caroni, (one of its major tributaries, which flows northward and which enters the Orinoco about sixty miles east of Ciudad Bolivar). All of the area, which is primarily jungle country, was listed as a Venezuela Reserve Zone on which concessions of only forty years were possible. Venezuela considered this area the only possible iron ore area. Bethlehem Steel has its El Pao mine in this region. Several deposits were found and two concessions were acquired, but neither measured up even remotely to the search for deposits which would match Hull-Rust-Mahoning of Minnesota.

Mr. Lake and his two principal geologists, Messrs. K. Burrell and F. Kihlstedt, then conceived the idea of aerially photographing the area south of the Orinoco, but west of the Caroni, an area open to denouncement, not particularly remote, and not generally considered to hold much promise of extensive ore deposits. The country here is in striking contrast to that previously explored, and its savannah and hills are not unlike the Southwest of the United States in general appearance. In early 1947, a contract was entered into with Fairchild Aerial Surveys, Inc. to photograph an area of about 11,000 square miles and to prepare maps on a scale of 1:40,000. A methodical and intensive study of these aerial photographs then began. By this time, Mr. Lake and his associates had correlated proven ore deposits with their appearance on aerial photographs in respect to shape, size, and vegetation and other physical characteristics. Even before all of this new area had been photographed, their attention was attracted to two small mountains or hills, known locally as La Parida and Arimagua. The former was located about 50 miles south of Ciudad Bolivar, and the latter about thirty miles to the east of La Parida. Both, as mentioned above, were west of the Caroni and south of the Orinoco Rivers.

On April 3, 1947, Mr. Kihlstedt, who is now mining engineer of the Orinoco Mining Company, started for La Parida in a jeep. La Parida is a prominent landmark of the region, the highest and largest hill of a group extending in a general east-west direction. For centuries a trail had run across the savannah near its base. The next day he struggled up its steep northern slope which was encrusted in iron ore, and saw ore exposed, in lavish masses, by great slides as high as 200 feet. Immediately he set up a reference point in the ore and took steps to file his claims. Title was obtained by denouncement, and five claims covered the area of the ore body. Early in 1948, the name of the hill was changed to Cerro Bolivar, in honor of the great Liberator of Venezuela.

Drilling was started in July, 1947, and by the latter part of that year, it was clear that an immense deposit of high-grade iron ore had been discovered. The length of the deposit is about four miles, its maximum width about 4000 feet, the average ore thickness about 230 feet, and the maximum proven ore thickness about 550 feet. It consists of extremely closely folded ore layers, and associated ferruginous quartzite. The average grade is by dry analysis, about 63.50 per cent iron, with the natural iron content calculated to be about 58 percent. The iron ore is practically free of sulphur and other objectionable elements. It is a mixture of hematite, limonite, and a small percentage of magnetite. Of the concessions acquired by United States Steel in Venezuela, the Cerro Bolivar area was considered the most promising and was the most intensively drilled. It proved up several hundred million gross tons of high-grade iron ore, the ore content of which is somewhat above the average Lake Superior iron ore. It is probable that the deposit is of sedimentary origin, with considerable secondary enrichment, and the ore body has been very much folded and faulted.

Cerro Bolivar lies 88 land miles from the junction of the Caroni and Orinoco Rivers. The junction, in turn, is 154 nautical miles from tidewater. From the mouth of the Cano Macareo (tidewater) to the Fairless Works at Morrisville is 2,004 nautical miles, and to

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Mr. Wanamaker is chief engineer, Orinoco Mining Company. He presented this talk on October 21, 1953, before the American Society of Civil Engineers in New York City.

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Mobile is 2,135 nautical miles. Studies indicated that the ore could be delivered at these ports in competition with Labrador ore and Lake Superior taconite, and that on a proper basis Venezuelan ore should find markets in the Gulf area, on the East Coast, and in the Pittsburgh and Youngstown areas. Accordingly, United States Steel planned to develop this ore body and to ship initially at the rate of five million gross tons annually, with provision for expansion to ten or more million tons annually.

The ore, which is practically free of overburden and which in some respects is an outer shell of the mountain, is to be mined with power shovels, loaded into dump trucks, and dumped from ore trucks into railroad cars at the top of the hill. Single rail tracks, 88 miles long, are being constructed from the top of the mountain to Puerto Ordaz, the junction of the Orinoco and the Caroni Rivers. The tracks have their predominate grade favoring the load. At Puerto Ordaz, the ore is to be transferred from the railroad cars by means of a car dumper and will pass through crushers to a belt conveyor system which will deliver it to a stockpile. From there a reclaiming system will remove the ore and load it directly into ocean-going vessels at dock side. Suitable docks, service and maintenance facilities, towns, and utilities will be provided. The ocean-going vessels will reach the port, which lies about 154 nautical miles inland, by way of a channel 26 feet deep at low water to be dredged in the river.

In the Cerro Bolivar area, the ore will be mined by two electric shovels, each with a capacity of eight cubic yards and one diesel-powered shovel with a capacity of six cubic yards. They will operate initially in three separate localities in 50 foot benches on top of the mountain and near its western end. The shovel capacity is ample to produce 5,000,000 long tons a year on a single-shift basis.

Holes drilled will be 7⅞ inches in diameter. The exact type and amount of equipment, size and spacing of holes, type and quantity of explosive still remain for determination after actual operations begin.

Sixteen trucks with a 20-cubic yard capacity will be shovel-loaded, and will haul the ore initially to two structural steel loading docks about a half mile away. The ore will be dumped at these docks directly into the ore cars on the rail tracks.

It is quite apparent, from what has been said, that this mining operation will be the reverse of normal open-pit mining, that is, the top of a mountain and a good proportion of its side slopes will be excavated, rather than digging into the earth below ground levels. In further illustration, it might be said that the uppermost ore is at elevation 775 meters, that a large tonnage lies above the 700 meter contour, and that ore lies down the mountain even below the 600 meter contour, which in turn is still 300 meters above the base of the mountain. Hence, the trucks, and the rail cars, will be running downhill under loads, and accordingly braking action is of paramount importance. The truck specifications called for a vehicle which, among other things, would go down an 8 per cent grade loaded, at any speed below 20 miles an hour, under the control of an auxiliary retarding

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The Engineer and His Customer

By Charles A. Maynard

Engineering has become extremely complicated. Today there are a multitude of specialized fields in engineering, with new ones springing up constantly. These are the growth of engineer's and scientist's dreams seeded in the fertile ground of physics and chemistry, cultivated with the tools of science and industry in an attempt to produce a harvest of physical things that will pacify the insatiable hungers of the human race. Each phase in the development of an idea into a finished product requires the solution of many problems, if progress is to be maintained. Among these problems one is repeated in each phase. It cannot be by-passed! It must be solved. This common problem is that someone must be convinced or made to accept the fact that the next step is necessary, someone that is in position to bring this about. At first this may not seem to be a part of the engineer's problems, but a close examination will reveal that it is within the province of the engineering method.

Engineers take pride in making a logical approach to their engineering problems. Their basic approach is called the engineering method and substantially incorporates the following steps:

A. Define the problem.
B. Obtain pertinent facts and data.
C. Apply engineering methods of analysis to the solution of the problem.
D. Draw conclusions.
E. Formulate plans of action and follow through.

The problem of "convincing someone that the next step is necessary" is a part of this last step of the engineering method that is often neglected or is not given the emphasis that is required. It is a problem that the engineer faces and it must be solved if further progress is to be achieved. Someone must be sold. The engineer has a customer and he is face to face with a sales problem.

The results of the engineer's work up to this point and his recommendations must be passed on to others. The degree to which the results and recommendations are an answer to the initial problem and the degree to which he convinces others that his recommendations are worthy of consideration determine the stature and recognition of the engineer or the engineering organization. The importance of successfully convincing "the powers that be" that the next step must be taken cannot be overemphasized. It is the crucial point which determines whether all the engineering effort can be brought to a successful conclusion or whether it fails miserably, regardless of the merits of the recommendations given. The problem is the same whether it be a very small project or one of mammoth proportions.

The Engineering Domain and Its Relation to the Customer

The title for this paper "The Engineer and His Customer" was selected because of the implications involved. Engineering could not exist in our economy unless an ultimate customer was convinced that the engineer's efforts are worthy of compensation. If the pages of history are turned back, it will be found that the compensation of the scientist and engineer was something to be desired. Men like Pythagoras, Roger Bacon, Bruno and Galileo received persecution and even death for their labor. Today it is easier to convince the ultimate customer that the work of the engineer is worthy of compensation and not persecution. The fabulous developments in all fields of engineering and science have caught the imagination of the public, and engineering has, in effect, been placed on a pedestal. This public acceptance is a tremendous advantage to the engineer in convincing others as to the merit of his reports and recommendations. However, it is not an excuse for a dictatorial attitude.

The engineer should apply logic to the problem of presenting his findings or recommendations just as he would to any other portion of an engineering problem. If this is done, the engineer will realize that engineering is not a domain in itself. It is a part of an organization which presents to the engineer the incidental and basic problems to be solved; which invests money in tools, material and labor of production and which through sales and advertising convince a sufficient segment of the public that the product is worthy of being purchased with its resources. Without the rest of the organization, engineering as such could not exist.

It is easy to realize that a problem on which much time and effort has been spent deserves an adequate presentation. However, it is just as important that the proper presentation be made for the very small jobs. The engineer is familiar with the presentation of formal reports and the more informal reports which may be in the form of a letter or memorandum. There is another kind of a report, merely a verbal report, and it may never appear in any written records. Even such reports are important as they affect the every day operations of a department, manufacturing processes and even advertising and sales. The purpose of all these reports reflects the engineer's basic problem, namely, that he convinces others, his customers, to accept the recommendations given and to incorporate them in their actions.

It is only in a few cases that the engineer speaks to the ultimate customer. In the every day work of the engineer, his contacts are with other engineers, with manufacturing, with purchasing, with managment and with the sales and advertising departments. To each of these groups he has a selling job to do.

Pitfalls To Be Overcome in Translating Reports Into Action

What helps to translate the labors of an engineer or a scientist into action by others? It is most important to realize the nature of the obstacles that must be overcome. Friar Bacon who was prophet and martyr in the cause of science, being persecuted, exiled from England and cast into prison, came face to face with some of these obstacles in their most virulent form. In his book *Opus Majus*, which proclaimed the fundamental importance of experimentation in science,

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Mr. Maynard, vice president, Research and Engineering, The Indiana Steel Products Company, Valparaiso, Indiana, presented this talk at the National Electronics Conference, September 30, 1953, in Chicago.

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there is this passage: "Now there are four chief obstacles that hinder every man, however learned, from grasping truth . . . namely, submission to ignorant authority, influence of customs, popular prejudice and concealment of our own ignorance."

Perhaps today these are not as apparent in the engineer's everyday problems. Mankind has progressed in his abilities to direct the physical things of life but it has always been by recognizing and working with the laws of nature. Francis Bacon put it, "For nature is not governed except by obedience." Like the physical laws, the nature of man has not changed and the same obstacles are present as in the times of Friar Bacon.

While there may be other obstacles that have to be overcome, those indicated by Friar Bacon will serve to illustrate the problem. The means used in overcoming these obstacles will in a large measure be the answer to others that might arise. Any report should be presented with a realization that its interpretation will be based on the background, environment, prejudice and knowledge of those receiving same.

In overcoming the obstacles, it is important for an engineer to have confidence in himself and the work that he has prepared. This should not be a glib confidence. It should be the result of a real knowledge of his field, not merely an accumulation of details, important as they may be, but a basic understanding of the principles involved and relative importance of the details. His knowledge should be such that he can relate his field with other fields. He should work so as to accumulate all the necessary facts and factors that will give a true and logical answer, being wary of selecting only those things which will lead to a preconceived answer or idea. Such an honest endeavor will give the engineer the confidence he requires. This confidence and a proper presentation of his endeavors will do a great deal in establishing his work as authoritative.

The customer may be influenced by "authorities." In fact, it is human nature to "pass the buck" as it were and lean heavily on some authority. To meet the obstacle of another authority, the engineer should create sufficient confidence on the part of the customer so that to him the engineer and his work are authoritative and worthy of substitution in case they conflict with previous ideas. While the foregoing is directed to the individual engineer, in a very real sense it applies to an engineering group as a unit.

A true confidence in himself on the part of the engineer will result in his having the confidence of his superior, of the manufacturing group, purchasing, sales and management. It will overcome many an objection such as, "This isn't the way we have been doing it."; "It won't work."; "What we have is good enough." and kindred holdovers that are fetishes of a less enlightened authority. Aim to make the engineer's report of such a nature that it will instill in the customer, whoever he may be, confidence that here is a new authority. Sounds good——but it takes work and is not often done in one fell swoop. It is not done without meeting and overcoming the problems on engineering and customer relations.

It is important that the engineer present his findings in a common language. This will enable one to overcome many prejudices. Too many people, and often the engineer's customer, would readily subscribe to an old definition of an engineer which is as follows, source unknown:

"An engineer is a person who passes as an exacting expert on the basis of being able to turn out with prolific fortitude infinite strings of incomprehensible formulas calculated with micrometric precision from vague assumptions which are based on debatable figures taken from inconclusive experiments carried out with instruments of problematical accuracy by persons of doubtful reliability and questionable mentality for the avowed purpose of annoying and confounding a hopeless chimerical group of fanatics referred to, all too frequently, as engineers."

To the engineer it is a joke on himself and not to be taken seriously. Unfortunately, in the minds of some it borders on the truth because their experiences have indicated that engineers act at times as though they are a world unto themselves; also, if the engineer cannot convince them, he will certainly try to confuse them.

It is necessary that a meticulous attempt be made to convey the information as simply as possible. Today there are a number of companies that are giving exhibitions of very complex machines to the public. The explanations concerning the machinery and principles involved are couched in terms that are generally of significance to Mr. Average Citizen. It is not beneath the dignity of an engineer to give up some of the engineering language if in so doing it will serve to a better understanding. There is a good precedent for this if it be needed.

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Your Pet Project MAY BECOME A PRIZE PAPER

Jot down the ideas you've had for a long time . . .

Maybe they'll help you think of others . . . Maybe they'll win you one of the five, $100 prizes

Here are the rules:

Any member of the Society may compete regardless of grade of membership.

Papers shall not be highly technical in nature. A clear, concise and interesting coverage is desired rather than complex formulae or derivations. The subject discussed should be of general interest to engineers but should not be of a political or highly controversial nature.

All members of the Society who wish to submit papers in this contest should contact the Secretary as early as possible and not later than February 1, 1954, and request a copy of the rules governing the competition and an outline of the minimum requirements for acceptance of papers. These cover in detail the mechanical make-up which should be followed in preparing and submitting papers for the contest.

Papers must be submitted to the Secretary for acceptance by April 1, 1954. If the Secretary finds that they meet the minimum requirements of the contest, he will forward them to the Awards Committee for review. The papers will be identified by number only. The Secretary of the Society is the only person who will maintain the key to the authors.

If any paper does not comply with such minimum requirements, the Secretary will so advise the author and discuss with him the points which are below the minimum requirements. The papers which are accepted will be forwarded to the Awards Committee for judging not later than May 1, 1954. Papers which have not met the minimum requirements by that time cannot be considered for prizes.

Papers which are accepted will be judged on originality of presentation, editorial merit and value to the engineering profession.

The papers submitted must not have been previously published in substantially the same form. No copyrighted materials shall be used unless permission has been obtained and so indicated. All manuscripts, drawings, etc., are to become the property of the Society and cannot be published without the consent of the Society.

If the papers submitted are NOT of sufficient merit to warrant the award of any or all of the prizes, the Awards Committee reserves the right to award less than the five established prizes or to postpone the competition.

The winners will be announced and the prizes presented at the annual meeting of the Society in June, 1954.

WSE Executive Secretary will furnish you with a complete set of rules and minimum requirements on request.

A Tribute to William S. Monroe

Mr. William S. Monroe, an Honorary Member and Past President of the Western Society of Engineers, passed away on September 12, 1953 at the age of 85 years, after a prolonged illness. During the last few years, Mr. Monroe had been failing in health so that the many friends he had acquired during a very active and interesting life were not able to enjoy his association as in the earlier years.

Mr. Monroe and his family have a long and close association with Chicago. He was born in Chicago on August 22, 1868, as the son of Henry S. Monroe, a prominent lawyer. He had intended to be a lawyer like his father, but showed an early interest in scientific activities. In his early school days, he worked chemical experiments with his schoolmates, one of whom was Burton Holmes, the well-known travel lecturer. After a summer job as a chemist in one of the Chicago Steel plants, he decided to take up engineering as a profession. His father recommended Cornell University, where his classmate from Geneva College, Andrew D. White, was President.

Mr. Monroe graduated from Cornell University in 1890 as a Mechanical Engineer. His first job was in the Mechanical Engineering Department for the World's Columbian Exposition under the direction of Frederick Sargent, who was Chief Engineer for the Exposition. After this work was completed, he set up an office as a Consulting Engineer, and in the year of 1900 joined the firm of Sargent & Lundy. When Frederick Sargent died in 1919, Mr. Monroe was elected President of the organization, a position he held until his retirement in 1938. During this period as the head of an organization specializing in power plant design, he was closely connected with the new developments that were a part of the tremendous growth of this industry. Many of the important milestones on the road to better and more economical power generation were laid during this period. Just to mention a few —increase in steam generator size from 5,000 kw to 208,000 kw; increase in steam pressure from 150#/sq. in. to 1250 #/sq. in.; increase in steam temperature from 450° to 900°; introduction of steam reheat in the middle 20's; improvements in fuel economy decreasing the fuel requirement per kwhr from 2# of coal to 1# of coal per kwhr. Mr. Monroe up to his retirement was active in planning the power plant development for such outstanding organizations as Commonwealth Edison Company, Public Service Company of Nothern Illinois, and many others throughout the Middlewest.

Mr. Monroe made frequent trips to Europe to be in contact with European developments in the Power Industry,

and retained a close association with leading engineers in Europe, as well as in the U. S. At the World Power Conference in 1924, held in London, he presented a paper entitled "The Use of Steam at High Pressures and High Temperatures in Central Stations." He was active in Engineering Societies and member of ASME, AIEE, Franklin Institute and American Association for Advancement of Science. In 1929 he was President of the Western Society of Engineers, at which time he gave a presidential address entitled "The Super Power System of the Chicago District."

Mr. Monroe had many interests outside the engineering profession. He was one of the Founders of the Prairie Club, a member of the Chicago Art Institute, very active in the Chicago Geographical Society, and was its director for many years. He was also interested in the Hull House Settlement, an interest which was particularly supported by Mrs. Monroe, the former Anna Hamill Clarke, whom he married in October, 1898, and who also showed great interest in the social work of the Salvation Army.

Mr. Monroe was outstandingly loyal and helpful to his many friends and retained close contact with them either through personal visits or letters. His broad interest both in art and science might well have been influenced by his family. His sister, Miss Harriet Monroe, was a poet and a great personality. One of his sisters, Mrs. Calhoun, was the wife of the American Ambassador to China for many years. Another sister was married to the very distinguished Chicago Architect, John W. Root, and through these and many other associations, Mr. Monroe obtained a broad outlook on humanity. An outstanding social event for many years was the New Year's Reception in the Monroe home, as well as the reception on his farm, where hundreds of Mr. and Mrs. Monroe's friends gathered.

Mr. Monroe's many friends and acquaintances will always cherish the memory of an interesting and warm personality. Mr. Monroe is survived by his son, Henry S. Monroe, residing in Winnetka, Illinois.

The Board of Directors of the Western Society has resolved that this memorial to a great engineer and outstanding personality be entered on the Society's Records and published in "Midwest Engineer."

Begin Prudential Steel Work

Erection of steel framework for the Prudential Insurance Company's 41-story office building at Michigan and Randolph just west of WSE Headquarters was to begin during the latter part of October, it was announced by Norman B. Obbard, vice president-general contracting manager of American Bridge Division of United States Steel Corporation, at a luncheon in the Union League Club in Chicago.

American Bridge will fabricate and erect the steel skeleton for Prudential's new mid-America headquarters. About 31,000 tons of structural steel will be used in the skyscraper. The building will occupy part of 80 acres of air rights over the Illinois Central Railroad yards between Michigan Avenue and the Lake.

Due to the construction scheme, Chicago commuters will be assured of uninterrupted transportation. Illinois Central will continue to operate its trains during erection of the steel framework. The building will straddle 19 tracks of the Illinois Central, but plans specify that only two tracks at the most will be taken out of operation at one time during construction.

The base plates, the first of which have just been laid, which are heavy circular slabs designed to hold columns and distribute weight over concrete, vary in size from 4 to 15 inches in thickness and 40 to 110 inches in diameter. They must be set with complete accuracy to hold the columns in perfect alignment.

"It will take about 125 American Bridge men one year to erect the huge columns and girders," Obbard said. Not since 1933, when the Field Building at LaSalle and Adams was constructed, have Chicago's sidewalk superintendents viewed the erection of an office skyscraper downtown. Methods of piecing together the towering steel skeletons have not changed much in 20 years, Obbard said. Two floors are erected at one time.

"Chicagoans will get their first glimpse of these ribs of steel jutting out from the skyline, when upper tier erection begins the latter part of February, 1954," Obbard declared. He described the method of erection as follows:

Steel for the lower tier will be erected with cranes. Steel for the upper tiers will be erected with guy derricks. Workers in the erecting gang climb up the columns to connect the beams and girders into place. After plumbing the columns for proper alignment, the connections will be permanently riveted. An important man in this gang is the heater. Standing beside his forge, he must pick out the proper size rivet, heat it to the right temperature without burning it and then pitch the gleaming metal up to the catcher, standing above him on a beam with one arm outstretched. The heater is almost as good as Allie Reynolds, for he can score a bull's-eye at 60 feet. Others in the gang are the riveter and the bucker-up, who exerts pressure on the head of the rivet while the other head is being formed.

The Prudential Building, which will cost approximately $37 million, is believed to be the most efficiently equipped office building in the world. Architecturally, its vertical limestone and aluminum facade is patterned after Rockefeller Center.

The building will be entirely air-conditioned. The 41st floor will have a deck

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Engineers Have Civic Duties

The engineer's job is a social as well as technical one, and he has a special obligation to participate in civic affairs in which good engineering is a vital factor, Carey H. Brown, manager of engineering and manufacturing services, Kodak Park Works, Eastman Kodak Company, told the fall meeting of The American Society of Mechanical Engineers Oct. 6 in Rochester, N. Y.

Increased instruction in the humanities by the engineering college does not necessarily guarantee graduates who become good citizens, Brown pointed out. The engineer needs to put his social science theories into practice, and there are numberless tasks in which he can join his efforts, in relation to governmental agencies—federal, state, county, and local—as well as private agencies like hospitals, Chambers of Commerce, educational institutions, and service clubs.

Intelligent selection of public officials is the obligation of all adult citizens, he emphasized. Referring to the large number of engineers in appointive office, he stated that their present generally honest record "points up the necessity for engineers to be alert to assure that governmental agencies reach decisions on engineering matters on the basis of engineering judgment and not for so-called 'political considerations'."

It is quite true that the engineer, accustomed to dealing with facts, is sometimes lacking in his ability to deal with people, Brown admitted. This results either in failure to get his views across, if the engineer attempts it himself, or in his turning over the task to the political leaders where it may be subjected to compromise or sacrifice of engineering judgment.

Aside from his concern with the proper conduct of public affairs of an engineering nature, the engineer in the role of citizen must be alert to exercise his right of suffrage, the speaker said. "I fear that engineers as a group may too often be plagued by inability to make a choice in political matters. The exercise of this right would confer a two-fold benefit—in obliging the engineer to reach a decision in a difficult matter, and in the exercise of the voting right itself.

"Political problems of the nation, or even of the state, are somewhat remote from the individual voter. But none can dispute the contention that proper conduct throughout the nation of local political affairs would guarantee equivalent conduct of the political affairs of large governmental units.

"Preservation and further development of the amenities of civilization require not only concern over governmental affairs, but also concern with the various private agencies and activities contributing to such amenities and their enhancement." Brown said.

"By ability and training the engineer should be able to play an important part in civic activities. He should know the value of time, and of the essentiality of its proper use," he said.

Serving the community with his abilities and talents is not merely the obligation of a good citizen, but the laboratory for development of an increased social consciousness of undoubted benefit to the engineering profession, Brown stated, warning, "Maintenance of our political, cultural and economic institutions against the destruction of Communism is dependent on the civic consciousness of the individual citizen and his active participation in the affairs of his community."

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for public view of the skyline. There will be one million square feet of rentable space, of which Prudential will use 30 per cent. The firm will employ 1,600 persons on the lower eight floors. The remainder will be leased with Leo J. Sheridan Company, Chicago, as rental agent. Naess and Murphy are the architects and engineers. Completion is due late in 1955.

Every window will be pivoted to permit washing from within. High-speed operatorless elevators will be installed. Escalators will be used between the Illinois Central station suburban platforms and the building's lobby. The world's "highest" escalators will connect the two top stories.

The building will have many outstanding features: Biggest tower floors (20,000 square feet) outside New York City; Fastest high-rise elevators in the world: 1400 feet per minute; Biggest built-in garage in the U. S., with space for 450 cars.

Materials Handling Scholarship Given

The country's first scholarship in the field of materials handling has been established at Illinois Institute of Technology in Chicago.

The $650 full-tuition grant was set up at IIT by the Chicago chapter of the American Materials Handling society.

Recipient of the initial scholarship is Joseph Bragen, an industrial engineering student majoring in materials handling at Illinois Tech. Wilbur Warner, MWSE, president of the chapter of the AMHS, presented a $650 check to Bragen in a ceremony marking the event.

Bragen will use the scholarship to complete his senior year at the Institute. He will be graduated in June, 1954.

During the current school year Bragen will serve as vice president of the Illinois Tech. chapter of the American Institute of Industrial Engineers.

AN AID TO CREATIVE ACTIVITY

Graphical Communications

By L. E. Grinter

When I was asked to address the Drawing Division at the Annual convention it was made clear that the invitation was being extended to me as Chairman of the Council Committee on Evaluation of Engineering Education. It is my purpose, therefore, to discuss briefly the difficult task assigned to this important committee and then to relate its objectives to those which I conceive to be the objectives of the Drawing Division. If the result brings home to you a great sense of your own responsibility for the future of engineering education, I shall be very pleased. Because, only as groups such as yours accept their part of the responsibility for the real future of engineering education can the Committee on Evaluation be relieved of its responsibility for indicating the way.

The charge to the Committee on Evaluation was made by President S. C. Hollister over a year ago. This charge was to determine how we should go about the education of the leaders of the engineering profession who will take over by 1975. It is evident to all of us that engineering education of the 1900-1910 decade did a good job of training the leaders for the 1920-1930 period. Engineering educators began to raise questions, however, when leadership in the development of electronics came out of physics rather than engineering, when soil mechanics and aerodynamics and mechanics of solids and fluids were introduced and then developed in this country so largely by European engineers. We noted that the training in physics and chemistry, and particularly mathematics, of these European engineers clearly surpassed our own even though they lacked our practical design work and had been trained in poorly equipped laboratories.

Then, of course, nuclear energy was thrust into our relatively unwilling and certainly inexpert hands by the inquiry minded physicists. We are now digesting the first meal of nuclear engineering, but this process is going on in industry and in government offices, not primarily in the colleges of engineering. Our 150 colleges have been too busy turning the crank that produces the uniform product known as typical 4-year engineering graduates to become really excited by the greatest revolution in the history of science and engineering. The Colleges of Engineering are located momentarily in the "eye" of a hurricane. No matter which direction the storm moves we are certain to have to rebuild a considerable part of the structure of engineering education as we have long known it.

I believe this to be true because engineering education has always maintained two objectives to be met by one curriculum pattern. These purposes are first to develop those who desire to become the specialists and scientists in the engineering profession and second those whose objectives would be met by a general-professional education in engineering. By general-professional education in engineering we mean education for service in the borderline areas between engineering and (1) business, management, law, agriculture or any other profession, (2) between engineering and a science such as geology, geophysics or biology, or (3) between engineering and the technologies of construction, production processes, operation, maintenance, or those specialized applications such as air conditioning, wood technology and so on. Hence, general-professional engineering education should probably be less specialized than our present curricula with more opportunities for exploration of other fields of knowledge.

Professional-scientific education for leadership 25 years from now would be expected to develop persons of competence in dealing with the new knowledge which is certain to appear as the end product of research in the pure sciences and in the engineering sciences of mechanics, electronics, thermodynamics, heat transfer and fluid flow. These engineering sciences are now the complete responsibility of the engineering profession. We must do the research as well as make the applications. The physicist has been overwhelmed by his responsibility for investigating the nucleus of the atom and has given up research in the scientific background of engineering. It seems unnecessary to elaborate upon the simple reasons why a single approach to engineering education can no longer bridge the widening stream between the general-professional objective and the professional-scientific objective. We straddled this gap, although not without difficulty, before 1940, but science and therefore the appropriate professional-scientific objectives in engineering education have undergone a revolution since 1940. We already have hundreds of new materials, new processes and new methods that are never mentioned in the classroom. How can we educate engineers to deal with the hundreds more that will spring forth next year or the year after, and to make original contributions toward producing these new materials and process? This is the new job demanded of professional-scientific engineering education of the near future.

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Mr. Grinter gave this talk before the Drawing Division Dinner of the 61st annual meeting of The American Society for Engineering Education on June 24, 1953. The meeting was held at the University of Florida in Gainesville where he is Dean of Graduate Studies and Director of Research.

Ore in Venezuela

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device, and independent of the wheel brakes.

The country from the base of Cerro Bolivar to the dock at Puerto Ordaz is generally rolling savannah with high hills. Vegetation is sparse and jungle growth is confined to the valleys and the vicinity of water courses. Excellent aggregate and fill materials are available for construction, and a great amount of granite rock has been encountered and is being made use of for track ballast. Nine steel deck bridges are required along the route of the rail tracks, none being of any great size.

The ore cars are being constructed four-axle, 90 long tons net load, weighing about 250,000 pounds loaded. They are equipped with standard air brakes with an additional straight air line which makes it possible to apply the brakes and charge the reservoirs at the same time, and thus provides an added safety factor. This is a unique system that could be adopted because the cars will not be in interchange. The cars are expected to move in 93-car trains initially, and later in 123-car trains, from an assembly yard on top of the mountain at its western end at an elevation about 1,000 feet above its base. From there the trains will run down a 3.1 per cent grade to the savannah and continue, generally on a downgrade, to the port. The locomotives are diesel electric, three-axle truck, 180 ton, 1,600 H.P. units. Three units are expected to handle a loaded 123-car train. Although the maximum adverse grades on the track are 0.5 per cent, they are so short as not to be governing, and the ruling grade with the equipment described is 0.2 per cent. The maximum curvature on the mountain is about 12 degrees and on savannah is 3 degrees. The tracks are designed for operation at speeds of 45 miles an hour. The average round-trip running time between the assembly yard at Cerro Bolivar and Puerto Ordaz is calculated at 7 hours 50 minutes. Twelve inches of crushed-stone ballast under the bottom of ties is used on all mainline track. The ties, with few exceptions, are creosoted Southern Pine or Gum, shipped from the United States. A small number of native ties were used, but their adoption in quantity was not possible because of lack of local production, unsuitability of the wood, and the absence of facilities for creosoting. The main line rail is 132 pounds per yard, and the track is standard gauge.

The number of trains per day will be small, two-loaded and two-empty trains per day for 5,000,000 tons a year. Although the system could be operated by either an automatic or manual block signal system, it was decided for reasons of economy in operation to adopt the centralized traffic control system. Since the tracks have four long passing tracks, the capacity of the system with centralized traffic control will approach that of a double-track road.

Orinoco has its own high frequency radio system between Caracas, Ciudad Bolivar, Puerto Ordaz, Cerro Bolivar, and the route from the mine to tidewater. Experiences gained in operation of this system indicated that radio signals could be used to actuate the traffic control system, thus avoiding the construction of a costly wire line 90 miles in length. Such a system is now being installed.

One of the most important features of the track operation will be the control of the heavily loaded ore trains on the seven-mile downgrade averaging three per cent from the mountain assembly yard to the savannah. Two run-a-way tracks are being provided on this section, with switches set for through-track operation. If speed exceeds 21 miles an hour through an electrically timed section preceding the location of a run-a-way track, the switch will be thrown and the ore train will leave the main track, and be stopped by the adverse grade of the run-a-way track.

A power plant will be constructed at the base of Cerro Bolivar to furnish power at the townsite and for the operation of the electric shovels at the mine. Two 2500-KW diesel-electric units will produce the power. At the port, where the load demand is considerably greater, a steam plant is being constructed with an initial installation of two 6000-KW units, and provision for a third. The boilers are oil-fired, rated at 75,000 pounds of steam an hour at 400 pounds pressure and 750 degrees temperature. Water will be taken directly from the Caroni River, through an intake equipped with travelling screens.

The dock at the terminal of the rail tracks is located at the mouth of the Caroni River, just above its junction with the Orinoco. The range of river stage between low and high water is 39 feet. A sound, but somewhat irregular rock foundation exists at the dock site. The dock is designed to support a shiploader weighing 1,500,000 pounds and travelling on 32 wheels (with maximum wheel load of about 25 tons), plus a deck load of 300 pounds per square foot. Bids were requested in 1951 for an 800 foot dock to consist of 20 foot diameter steel pile cells, strengthened internally with structural members and Tremie concrete, filled with crushed stone, and supporting heavy 25 foot deep steel trusses which, in turn would carry a concrete deck. A spring fendering system to protect the dock was included.

An alternate design was suggested by

one of the original bidders, calling for a more conventional type of structure consisting of a single row of over-lapping 81 foot diameter, steel sheet pile cells directly supporting the deck. An engineering review indicated the need for internal bracing in their upper 25 feet, and other changes in structural details. Although it would have taken about the same length of time to build this structure, it would not have been interfered with at high river stages and hence construction could have been started at any season of the year.

In any case, however, the time schedule for either type was too long for consideration and an entirely different type of dock was finally determined upon. The savings in time of erection were very great and there was assurance that the first section of this dock would be ready in time to receive initial shipments of other construction materials to the site.

The ore handling and storage system is designed to receive run-of-pit iron ore in cars, haul the cars to a rotary dumper, dump them, scalp and crush the ore to a product of which 85 per cent will pass between grizzly bars, convey to a stockpile by means of a conveyor bridge, reclaim the ore, weigh automatically, and convey to ships. The car dumper and its barney haul are designed to handle cars each containing 90 tons of ore at the rate of 67 an hour. The crushing and conveying system is designed to handle 6,000 long tons per hour, with provision to double this rate.

One of the basic plans considered was to locate the primary crusher at the top of the mine to transport the ore by truck to drive-over dump pockets and crush to minus six inches, then to convey the ore by belt conveyors down the mountainside to the savannah where it would be prepared for shipment. This plan was discarded infavor of the present plan. By locating the crushing plant and ore handling system at Puerto Ordaz, it is available for handling the ore from deposits other than Cerro Bolivar.

Some of the outstanding or unusual features of the ore handling system include: (1) its enormous capacity, designed to handle *1.67 tons of ore per second;* (2) the size and speed of the car dumper; (3) the massive primary gyratory crusher built and installed in a pit over 100 feet deep; (4) the reclaiming tunnels under the stockpile, with continuous slot, and the rotary plows for feeding to conveyor belts; (5) the continuous sampling system which takes 60 tons per hour off the belt and reduces this to a five-pound sample per hour; (6) the avoidance of hoppers and use of apron feeders with transfer belts to provide for more uniform belt loading and better operating characteristics and (7) the use of a DC variable voltage system from reclaiming tunnels to shiploader so as to provide a completely interlocked, variable speed, operation.

Towns are being built at both the port and the mine. In addition to usual community facilities, three types of houses are being constructed, a row type for general workers, providing 700 square feet per unit, detached houses for white-collared workers of from 1,045 to 1,285 square feet of floor area, and staff houses with from 1,400 to 1,630 square feet of floor area. All were designed by Venezuelan architects, and are constructed of native materials with particular attention to termite resistance. They are concrete block, single-story houses with concrete floors, and a flat concrete roof with asphalt felt paper and stone chips covering. Windows are native wood jalousies and are screened and special type blocks in outside walls immediately under the roof assist in providing through ventilation.

An excellent but somewhat limited water supply for the town at Cerro Bolivar and for mining operations will be obtained from a series of natural springs at and near the base of the mountain. The supply at Puerto Ordaz is from the Orinoco River, and is pumped to a treatment plant where it is coagulated, filtered, and chlorinated, and then pumped into the distribution system.

Two plans were considered for transporting the ore from Cerro Bolivar to tidewater; one, the construction of rail tracks directly northward to the Venezuelan coast in the vicinity of Barcelona, and the other a combination of rail tracks and river route. The former would have required about 275 miles of mainline tracks, and the construction of a major bridge across the Orinoco just upstream from Ciudad Bolivar. The bridge would have a total length of about 17,000 feet and its construction would have been the equivalent of bridging one of the wide reaches of the Lower Mississippi River. Before reaching the northern coast of Venezuela, the tracks would climb to an elevation of about 1,000 feet in order to cross the divide prior to the descent to Barcelona. Comparative costs were made on the basis of rather detailed surveys and the matter was considered by a Venezuelan Commission created to study the two routes proposed. After considering all of the factors involved, includ-

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ing the time schedule for construction, initial investment cost, and annual costs of operation and maintenance, and the interests of the Government in opening to international commerce the agricultural, commercial, and industrial potentialities of this region of Venezuela, it was determined that the best solution would be the construction of the rail tracks to Puerto Ordaz, and the development of a channel in the Orinoco-Cano Macareo to the sea.

The Port is located at the confluence of the Orinoco River and the Caroni, one of its major tributaries. The former is one of the great rivers of the world and drains an area in the tropics of some 378,000 square miles. Puerto Ordaz is about 160 miles above the mouth of the main river, the "Boca Grande." About 50 miles below the Port, the river begins to discharge to the north and northeast through numerous large distributaries called Canos, the first of which to leave the main river is the Cano Macareo. Eleven miles down this Cano, the Macareo divides into two streams, the larger and more westerly branch of which is called the Manamo. The roughly triangular area through which the river and its distributaries flow is called the Orinoco Delta. Its front on the Atlantic Ocean and on the Gulf of Paria extends for about 200 miles, and the area is all subject to overflow during extreme high-river stages.

The periods of high and low river stages occur with great regularity and follow the change in the seasons with the annual low in late March, and the annual high in August. The variation is 39 feet at the Port, and at the point where the Cano Macareo leaves the main river is about 27 feet.

The Boca Grande route is the one now used by Bethlehem Steel for shipment of its ore from Palua immediately downstream from our Port to the sea. This Company, however, ships in comparatively light draft vessels and ore barges to a transfer station on the north coast of Venezuela where the ore is reloaded into seagoing ore carriers. The ocean bar at Boca Grande is about 19 miles across between the 25 foot depth contours. It can be crossed at high tide by vessels drawing no more than about 19 feet. A dependable deep-draft channel across such a bar, subjected as it is to unfavorable currents and wave action, would require the construction of two jetties, each between 16 and 20 miles in length. The cost of such an undertaking would have been prohibitive and the Boca Grande was therefore eliminated from further consideration.

As between the principal distributaries, the Macareo, and the Manamo, the former was considered to be the most promising. It is confined to a single channel which should require less original dredging and much less maintenance dredging. The ocean bar crossing at the mouth of the Macareo, with natural depths of about 17 feet at high water, would be comparatively short, and, it was hoped, could be held without jetties. The Company engaged a dredging concern to make a preliminary examination and survey with estimates of costs of dredging and maintaining a ship channel through this route to tidewater. The report was excellent in its presentation and was quite enthusiastic for the development of the Macareo and optimistic on the question of maintenance. This report was reviewed at the request of United States Steel by the Waterways Experiment Station of the Corps of Engineers, United States Army, at Vicksburg, Mississippi, which, while believing the data presented indicated that an open river improvement was practicable, felt that a serious maintenance problem was a definite possibility. Decision was reached, therefore, to adopt the Macareo route to the sea.

A contract was negotiated in November, 1951 to dredge a channel from Puerto Ordaz to the sea and to provide a 26 foot depth at low tide and a 250 foot width, widening to 400 feet at the mouth, the work to be completed by late 1953. Work was begun by two large cutterhead dredges, the *CARIBBEAN* and the *PERU* in February and March, 1952, respectively. Dredging has proceeded without delays or difficulties and by August, 1953, most of the original dredging had been completed to project dimension totalling about 32,000,000 cubic yards, together with some re-dredging to maintain project depths. The first vessel to utilize the new route navigated downstream light from Puerto Ordaz to the sea on July 17, 1953, and since that date the regular supply vessels of the Company have been navigating upstream loaded to 17 feet for the purposes of training native pilots, and to test the alignment of the channel, the navigation aids and to ascertain behavior under traffic. Construction in the field started in February, 1952. It was well under way by the middle of that year, and 65,000 of the 150,000 tons of material and equipment required for the project had been delivered to the site. The early shipments consisted of construction equipment for rail tracks, highway, camp, etc., and materials for temporary camps and utilities. Manpower employed on the project reached its peak about one year later when a total of 7,040 were employed by all parties concerned at the site. Of these, 5,100 were Venezuelans.

Local materials were used to the maximum extent. All cement and petroleum products, and most of the lumber, tools, and minor supplies were Venezuelan products. Prime contracts were awarded to some 30 Venezuelan firms and many of these, in turn, have entered into subcontracts with other Venezuelan contractors.

In February, 1953, Mr. Benjamin F. Fairless, Chairman of the Board, United States Steel Corporation, and other top officials of the Corporation, visited the project and met with the President of

Venezuela and members of his cabinet. While in Caracas, Mr. Fairless addressed the Chamber of Commerce and the Chamber of Manufacturers of Caracas at a luncheon on the subject of United States Steel's activities in Venezuela, which he called a "cooperative venture." His address concluded with the following remarks:

"We are—as I have said—partners in this venture.

"The purpose of our partnership is to transform iron into gold—not through the mysterious black magic of the ancient alchemists, but through the modern miracle of mutual incentive under a system of *Free Enterprise.*

"At this particular moment, of course, when our venture is still in the development stage, my side of our partnership is busily engaged in the task of turning gold into iron; and for many months now, a great stream of money has been flowing southward, from my country to yours, thus increasing the wealth of your nation and the prosperity of your people.

"Then, some months hence, we know a red stream of iron ore will start coursing northward where it will be changed into money. In turn, money will flow back once again into Venezuela.

"But if in the course of this partnership of ours, we produce nothing more than ore and money, we shall have failed dismally, in my opinion, to take advantage of the greatest opportunity offered only under a system of free enterprise, which now confronts us; for there is one commodity which is far more precious, and much rarer, in this world today, than either gold or iron.

"That commodity is friendship; and that, above all else, is what we seek . . ."

WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

27-53 Charles T. Beckmann, Layout Draftsman, Link-Belt Co., 300 W. 39th St.

28-53 Walter G. Leininger, President, Leininger Construction Co., 30 N. LaSalle St.

29-53 Paul Weir, Principal Consultant, Paul Weir Co., 20 N. Wacker Dr.

30-53 Robert L. Bard (Rein.), Superintendent, Overhead Construction, Commonwealth Edison Co., 72 W. Adams St.

31-53 Archie H. Weir, Superintendent of Substation Construction, Public Service Company, 1319 S. 1st Ave., Maywood, Ill.

32-53 Mrs. Jewel B. Gardner, Chief Draftswoman, Traffic & Transportation Dept., DeLeuw, Cather & Co., 150 N. Wacker Dr.

33-53 Sigmund Serafin, Engineer, DeLeuw, Cather & Co., 150 N. Wacker Dr.

34-53 Laurence A. Dondanville, Junior Traffic Engineer, DeLeuw, Cather & Co., 150 N. Wacker Dr.

35-53 Henry J. Klemchuk, Mechanical Engineer, Water Works Design Div., City of Chicago, City Hall.

36-53 Helmut G. Klempt, Chief Estimator, DeLeuw, Cather & Co., 150 N. Wacker Dr.

37-53 Joseph C. Margetic, Division Engineer, Chicago Transit Authority, 3900 West End Av.

38-53 Eugene A. Smith, Traffic Engineer, DeLeuw, Cather & Co., 150 N. Wacker Dr.

39-53 Jack C. Steinsberger, DeLeuw, Cather & Co., 150 N. Wacker Dr.

40-53 Casmer A. Benowicz, Vice President, Zeigler Coal & Coke Co., 21 E. Van Buren St.

41-53 William O. Bruce, Engineer, DeLeuw, Cather & Co., 150 N. Wacker Dr.

42-53 Thomas G. Cleaver, Sales Engineer, United States Steel Corp., Chicago.

43-53 Wm. R. Hurley, Assist. Chief Electrical Engineer, DeLeuw, Cather & Co., 150 N. Wacker Dr.

44-53 Miss Clara Hardtke, Stenographer, DeLeuw, Cather & Co., 150 N. Wacker Dr.

45-53 George W. Land, Industrial Consultant, Peabody Coal Co., 231 S. LaSalle St.

46-53 Edward J. Gardner, Assist. to Vice Pres.-Operation, Inland Steel Co., 38 S. Dearborn St.

47-53 David Ritsema, Structural Designer, DeLeuw, Cather & Co., 150 N. Wacker Dr.

48-53 Robert E. Smith, Project Manager, DeLeuw, Cather & Co., 150 N. Wacker Dr.

49-53 Bert Exelrod, Owner, Bert Exelrod-Engineering, 608 S. Dearborn St.

The Engineer's Customer

(Continued from Page 6)

It goes back a long way. In setting forth an observation in a common language, one of the basic concepts of physics was developed. About 1025 A. D. one of the physicists of the Mohammedan culture, namely, Abu R Raihan Muhammad ibm Ahmad al-Biruni, invented the overflow method of finding the density of a body. He recognized that others might be unfamiliar with the Persian units of weight and volume. It was his desire to transmit the results that he obtained so that all would understand. Accordingly, he expressed his results independently of any units and introduced the idea of specific gravity, being a ratio of the weight of a body to that of an equal volume of water.

A common language is a great aid in overcoming any prejudice, and it also enables the customer to better evaluate the work that the engineer has done. Do not let the work be hidden in engineering verbiage. Even engineers appreciate a simple presentation if it makes for economy of effort. Also, it is to be remembered that the majority of presentations are primarily to serve the customer and not for the self-aggrandizement of the engineer.

It is important in a presentation that one fundamental idea be instilled in the customer, namely, that the work and recommendations given are aimed to serve him. This is not only an idea to be instilled in the customer's mind, but it is a truth that is fundamental. Unless it is to the customer's advantage, he will look elsewhere. Surprisingly enough, this is a two-edge sword; it works both in selling a product and in purchasing a product or commodity. It is self-evident in selling a product; it is also true in purchasing. If engineering sets up more and more stringent requirements and expects to have its requirements met without adequate compensation, the suppliers lose interest and another source must be persuaded that it is to their advantage to take on this production. If changes in a product are required which are different from the customer's stated desires, it is important to point out the advantages to him . . . not that it makes the job easier for the engineer or his company.

All the persecutions of great scientists were due to this one basic fact; the people, the church, the governments and even other scientists could not conceive the idea that a knowledge of the truth was to their advantage. In more recent times technological developments of the spinning machine, the steam engine and others have had to make progress in spite of a large number that believed it was not to their immediate advantage.

Fortunately, the engineer is not generally faced with the necessity of convincing the masses. His customers are individuals and groups. Other engineers are interested in achieving results that they desire. Manufacturing is interested in savings in cost, machine time, facilities or the elimination of undesirable conditions. Sales and advertising desire a "gimmick" to make their job easier, such as a superior product at a lower cost with special appeal. Management wants all these at a profit with a minimum of expenditures. The engineer's problems as such mean little to his cuscustomer. Fundamentally, what will it do for them such as saving money, time or work; or enhance their prestige? Making life more enjoyable is the important thing to the customer. In other words, the engineer's efforts are aimed to present findings and recommendations that will meet his customer's requirements. There is a poem that sums up these ideas from the customer's point of view entitled, "Tell Me Quick and Tell Me True (or else, my love, to heck with you)" by Victor O. Schwab. It reads as follows:

I see that you've spent quite a big wad of dough
To tell me the things you think I should know.
Now your plant is so big, so fine, and so strong;
And your founder had whiskers so handsomely long.
So he started the business in old '92!
How tremendously int'resting that is . . . to you.
He built up the thing with the blood of his life?
(I'll run home like mad, tell that to my wife!)
Your machinery's modern and oh so complete;
Your "rep" is so flawless; your workers so neat.
Your motto is "Quality" . . . capital "Q"—
No wonder I'm tired of "Your" and of "You"!
So tell me quick and tell me true
(Or else, my love, the heck with you!)
Less—"how this product came to be";
More—what the darn thing does for me!

Will it save me money or time or work;
Or hike up my pay with a welcome jerk?
What drudgery, worry, or loss will it cut,
Can it yank me out of a personal rut?
Perhaps it can make my appearance so swell
That my telephone calls will wear out the bell;
And thus it might win me lots of fine friends—
(And one never knows where such a thing ends!)
I wonder how much it could do for my health?
Could it show me a way to acquire some wealth—
Better things for myself, for the kids and the wife,
Or how to quit work somewhat early in life?

So tell me quick and tell me true
(Or else, my love, the heck with you!)
Less—"how this product came to be";
More—"what the thing does for me!"

If the engineer can make the customer feel that the engineer is really working for him, it will overcome obstacles such as influence of customs and popular prejudice.

Ignorance is a word that is fraught with ugly implications. It is human nature to avoid it being directed at one's self although it may well be accepted in others. One of the most exasperating remarks is, "You should have known better." Sometimes engineer's reports and remarks, while not couched in such terms, leave that implication. In an engineer's contacts with others, he should cultivate the attitude that the customer is important and his opinions merit consideration.

Basically, a part of an engineer's philosophy should be: an obvious diversity of opinion regarding a problem can be resolved with mutual advantage to all if the true facts are presented. All have heard of the Quaker meetings. In these meetings there is never a vote taken. Facts and factors are presented until there is unanimous agreement. This procedure has much merit. One of the most infuriating things to one's ego is to be publicly embarrassed. It should never happen to a customer. It usually leads to embitterment or adamant attitudes which are difficult to resolve. If differences arise, it may well be that the engineer has not taken into account all of the factors, some of which may be human reactions, or he has concealed his ignorance. (In his own field, the engineer should have the necessary knowledge.) Often a disclosure of his ignorance as to related matters will lead to a further development as to the factors involved. In any case, the issues should be developed in such a manner that at no time is the customer allowed to "get out on the limb" without a graceful way to back down. It sometimes requires finesse. The efforts will really pay off, especially if the customer can have a measure of pride in the ultimate conclusion as being his brain-child or at least his contributing a portion thereof. Truly, ignorance either on the part of the engineer or the customer is one of the chief obstacles to be overcome and all possible means should be used in overcoming this obstacle.

An Engineer's Philosophy Concerning His Customer

No attempt has been made to present details of format or set approaches as to the relationship between the engineer and his customer. A basic knowledge as to the engineer's place in the order of things and a realization that his developments are not mere reports but are useful to others in furthering the march of progress should be a source of genuine pride to the engineer. With a knowledge of the type of obstacles to be surmounted, human reactions and the end results desired, he can develop his own philosophy concerning the engineer and his customer. This can become the lodestone in developing his presentations so that his endeavors will be translated so as to satisfy some of the longings of humanity. The philosophy expressed in three passages from the poem, "Concerning the Nature of Things" by Lucretius, a scientist and poet in the times of Julius Caesar, may well serve as a guiding principle in the engineering presentation. He writes:

"Now apply your mind, I pray, to a true reasoning; for a truth wondrously new is struggling to reach your ears, and a new view of creation to reveal itself . . .

"Nor am I unaware of the difficulty of expounding in Latin verses the abstruse discoveries of the Greeks, especially when many of the notions necessitate the coining of new words because of the poverty of our language and the novelty of ideas . . .

"But your merit and the anticipated pleasure of your sweet friendship urge me to undertake any toil and induce me to keep vigil through the silent nights, searching by what words, yea and in what measures, to spread before your mind a bright light by which you may examine deeply into hidden truths . . ."

Graphical Communications

(Continued from Page 11)

I now want to try to analyze how this revolution in engineering itself will influence the requirements placed upon the drawing teachers in our engineering colleges. Instead of looking at present courses let us try to look at the engineer of the future and his place in industry or government. The shortage of engineers is real. Also, there is every reason to believe that except for short periods of recession it will be permanent. Industry is moving steadily toward a larger and larger percentage of engineers in its total list of employees. The ratio is one-to-fifty on the average, but G. E. uses one-to-twenty and others will try to follow suit. If Dean Hollister's analysis of the available raw material is correct, and I believe it is, there will not be enough students with I. Q.'s that permit college graduation to meet the demands for doctors, lawyers, bankers, scientists, and engineers. Hence, industry must start, as it now has, to make better use of its engineers. This means that engineers will be given technical aids for such work as drafting, which is one of the engineers jobs that can be delegated in large measure.

If we adopt the concept that the engineer need not be trained to produce engineering drawings but that his job is to supervise their production, I believe that a subtle but important difference will develop in the choice and presentation of subject matter in our classes in technical or engineering drawing. Let the teacher test each bit of subject matter by this measure and he may be amazed at the change he desires to make in his course. One may wonder whether the individual who supervises the production of drawings need not know as much about drawing techniques as the draftsman himself. This would certainly be true of a chief draftsman but I visualize the supervision of the engineer to be of an entirely different character. It is not his job to tell the draftsman how to present the graphical result desired. He merely needs to communicate his needs in a commonly understood language. The draftsman under the supervision of a chief draftsman should be capable of producing the results desired as soon as the requirements have been communicated.

(Continued on Page 18)

(Continued from Page 17)

What are the responsibilities of engineering education in developing this capacity of engineers to communicate rapidly and clearly with draftsmen? I believe the required knowledge and training are two-fold. First the engineer needs ability far beyond his present training in technical sketching and chart making which are the perfect media for transmitting his thoughts not only to the draftsman but to his associated group of workers and to his superiors. Secondly, the needs to be able to understand the language of the blueprint itself since that language is an exact method of technical communication between engineers, draftsmen, estimators, and construction, production or maintenance men. Any capacity that the engineer may have developed toward personal production of a drawing will have trivial value in the future as compared to these overriding needs for ability to communicate ideas crudely by technical sketching and exactly by blueprint reading and the use of charts. Technical sketching is also one of those media by which the engineer draws creative ideas forth from the recesses of his mind and presents them for his own analytical study. As such, technical sketching can be taught as a part of the creative process in engineering education.

I am sure that those who wish to do so can develop a well documented case for the importance of the present methods of teaching engineering drawing as prerequisite to the knowledge I have indicated as essential to the engineer of the future. In fact, every teacher has good arguments readily at hand for justifying the old ways of developing an engineer. But a revolution can seldom be stopped and can never be turned back. We are in the midst of a decade that will inevitably be considered a period of scientific and engineering development of such sharp gradient that no word other than revolution can be considered adequately descriptive. In such a period it is inevitable that long established traditions will crumble. I was taught technical drawing in much the same way that I see it being taught in our colleges today. But it was confidently assumed by my teachers that I would earn my living for a time, at least, as an engineering draftsman. Actually in several years in industry where I worked in a drafting room I was never asked to make a drawing although I worked continually with drawings and prints. During this period too I taught myself to do sketching and to understand and make charts. The mere fact that I had the doctor's degree gave me this experience that was no doubt unusual in 1930, but which is rapidly approaching the norm for present-day baccalaureate graduates. As long as employees could hire engineers at about the same salary as that of a draftsman, engineers and draftsmen were essentially indistinguishable. However, times are changing in that regard. I believe that the salary spread between engineers and draftsmen will rapidly increase in the years ahead and that the time is approaching when engineers will not even be permitted by union-company regulations to make a drawing. It is such relatively radical changes in perspective that lead me to suggest the survey of your courses in drawing from the viewpoint strictly of graphical communication. If any technique is to be included I suggest that the great value to the engineer of ability to communicate by free-hand sketches and charts be recognized more fully.

The opportunity to contribute to the development of the creative capacity in engineers lies almost untouched in the classroom in drawing. We know that whenever an engineer starts the process of attempting to create a new machine, structure or process his pencil is soon at work either writing equations or making sketches. The facility you train into his mind-hand relationship will bear directly upon his later success in bringing vague mental images into clear, working relationships expressed graphically in a language that is universal to engineers. Those who move forcefully and fearlessly to achieve this capacity for their students in technical drawing will earn the greatest praise from the engineers of the future.

Crerar Library
News and Notes

Continuing their enthusiastic interest of previous years, the American Academy of Pediatrics again invited the Library to prepare an exhibit for their annual meeting. Miss Ella Salmonsen, Chief of Crerar's Medical Department, spent the week of October 5-9 in Miami, Florida, greeting many friends attending the meetings, and discoursing on examples selected from extensive collections on pediatrics. A number of the classics in the field, rare treatises, and current journals were displayed. Two portable exhibit cases designed by the Librarian were used for the first time. Hinged at the middle, each case provides two sections, with Lucite front panels. Traveling displays for conventions and meetings will be considerably enhanced.

* * *

On November 2, 3, and 4 the first annual Institute on Logic and Machines in Organizing Information was held in Washington at the offices of Documentation, Inc. Sessions were devoted to methods of data and information recovery and provided comparative systems analyses covering magnetic tape, punched and edge-notched cards, microfilm (Rapid Selector) and other means. Considerable emphasis was given to the Uniterm System of coordinate indexing, a development of the sponsoring corporation. The Institute was attended by Herman H. Henkle, Librarian, who also took part in Washington meetings of the American Documentation Institute on November 5 and 6.

* * *

Additional equipment recently installed in the Photoduplication Service enables the Library to provide enlargement prints from microfilm negatives. It is thus possible for patrons to obtain full size personal copies of articles or monographs where the Library's own set is on microfilm only. Special devices have also been obtained so that a 4″ x 5″ copying camera and enlarging attachment are now available to provide the prints necessary for half-tone or other exacting reproduction purposes.

Look for New Pipeline Uses

"The ultimate uses of pipelines as a means of mass transportation give wide range to the imagination," George E. MacDonald, representative of the Great Neck, New York, engineering firm of Lockwood, Kessler & Bartlett, said on Oct. 19 in a paper presented to the annual meeting of the American Society of Civil Engineers in New York City.

"Since its inception," MacDonald said, "the petroleum industry has relied heavily on survey and mapping techniques. Exploring for new oil or gas fields and the development of unproven reserves have constantly kept geological field parties traversing and mapping the remote corners of the world. The development of the airborne magnetometer was largely due to the exploratory requirements of the petroleum industry and aerial photography has been a significant factor in reducing the mapping efforts formerly conducted by geologists.

"These exploratory types of surveys and the resulting discoveries of oil and gas fields have unquestionably been spectacular and due to their very nature have been conspicuous.

"However, as the petroleum industry expanded and developed, the need for economical transportation of its products to its markets, soon led to the advent of long range, 'big inch' pipeline as a means of transportation. The subsequent growth of the pipeline as an economical means of mass transportation has been a rapid modern day revolution.

"The office of Petroleum Administration for Defense estimates that about 163,000 miles of petroleum pipe lines were in operation with the U. S. as of January 1, 1953, and an additional 10,000 miles are expected to be placed in operation this year. The natural gas industries expansion of operating transmission pipelines has been no less rapid. The American Gas Association reports that from 1936 to 1951 the miles of transmission lines operating in the U.S. increased from 55,000 to 118,000.

"Though the oil and gas industries are the undisputed giants of cross-country pipelines, the ultimate uses of pipelines as a means of mass transportation give wide range to the imagination.

"Successful tests have already been made by Pittsburgh Consolidation Coal Co. on shipping coal by pipeline. Though still in a developmental stage, the piped coal is finely crushed, immersed in water and forced by pressure pumps through the pipeline. It was estimated that such a line from Cadiz, Ohio to Lake Erie, a distance of over 100 miles, might conceivably deliver coal for $1.00 a ton less than rail fare, the current rate being about $2.75 a ton.

"The entire development of the pipeline industry was, of course, based on the fundamental fact that this was the most economical means of transporting great volumes of the product. Such economic transportation not only depends upon the operating costs of the system but also upon the initial construction costs. Each of these factors must be borne in mind when locating a pipeline and consequently the location survey may be considered the most important of the several types of surveys attendent to pipeline construction."

Over-enthusiasm May Hide Methods

Over-enthusiasm in striving to achieve greater mass production techniques may be leading United States industry to overlook certain facets of new methods which could wipe out years of progress.

This was the opinion of James Robinson, chief engineer for Vickers, Inc., Detroit, in an address on Oct. 9 before the industrial nonflammable fluids session of the National Conference on Industrial Hydraulics at the Sheraton hotel in Chicago.

The conference is sponsored annually by Illinois Institute of Technology and Armour Research Foundation of Illinois Institute of Technology.

"In the race for increased mass production," Robinson said, American industry has been inclined to "overlook the fact that new techniques in production may necessitate the use of certain materials which could, should one slight accident occur, cause a chain reaction of other accidents that could be disastrous."

"While I do not believe that the recently publicized industrial fires have been directly caused by the presence of hydraulic oils, undoubtedly the amounts of such fluids in any plant add to a conflagration once it is under way," Robinson said.

Robinson pointed out that the industrial fires would not have been as intense without hydraulic oils to feed the flames. He emphasized that the use of synthetic nonflammable fluids would certainly have decreased the intensity of the blazes.

"With synthetic fluids available, why are they not more generally in use?" he asked. He outlined two major considerations which influence the acceptance of nonflammable fluids.

"First, can these fluids be used satisfactorily from a working standpoint? Secondly, what changes, if any, must be made to the machine or other hydraulic circuit to insure satisfactory performance?"

The effect today of nonflammable fluids in machine tools has shown remarkable results, he said.

"Perhaps synthetic fluids are being adopted because they are the easy way out of hazardous conditions, such as fires, rather than the removal of the cause of fires by better engineering and improved maintenance. Whatever the reason, we all must realize that synthetic fluids are here to stay," he concluded.

Magnet Is Performer

An Alnico magnet that performs six distinct jobs simultaneously has been developed for use in an electronic recorder of unusual design.

The permanent magnet, less than ¼-inch square, is made of nickel, aluminum, cobalt and iron. It gets magnetized in the process of being heat-treated.

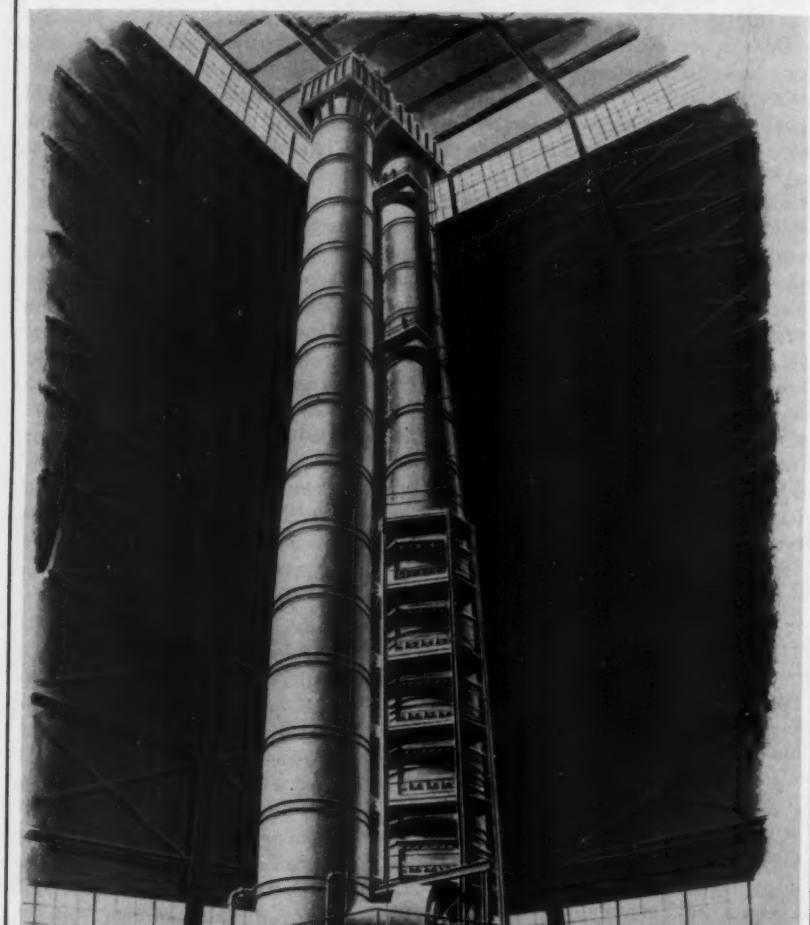
When attached to the pen arm of the Multi-Record Dynalog Recorder, the tiny magnet provides for precise and dependable measurements of temperature, pressure, humidity and other variables all at once.

Its function is to pick off, either at once or in sequence, six differently colored pens so that each pen will be inked by its own pad and no other. It is shaped to hold the pen points in precise position while the dot is penned on the chart. A full day's or week's record of up to six measurements can be completed on one circular chart.

In operation it does the work of six instruments but uses only one chart and one pen arm for recording all of them. An electric signal causes the pen arm magnet to pick up any or all of the six pen points and ink the chart according to the impulses received.

Applications in industry are numerous: In open hearth furnaces, for example, the recorder measures the temperature of the checker chambers. In brewing, the instrument stands guard over the pasteurization process to assure the quality of the bottled brew. In power stations, compressors, generators, pumps and similar machinery are protected from overheating by the instrument. Other uses include brick and ceramic kilns, petroleum refineries, chemical retorts, caustic cookers and reactors—in short, wherever an accurate record of more than one measurement is required.

World's Highest Furnace



—Westinghouse Photo

The world's tallest furnace—high as a 13-story building—is being built by the Westinghouse Electric Corporation at its Industrial Heating Department plant here. The furnace's 130-foot vertical tower—shown in this artist's drawing—will be used to heat-treat long, extruded aluminum shapes required primarily by manufacturers of airplanes. Aluminum pieces 110 feet long will be suspended in the tower for specified periods of time. At the end of the heat bath, the suspended pieces will be plunged quickly into a water-filled pit of the same depth for fast cooling, or quenching. In a furnace such as this one, the temperature difference between the top of the tower and the bottom must be slight. In this gas-fired unit, there will be a maximum temperature difference of less than five degrees. This is accomplished by maintaining a high rate of air circulation. The furnace shown above is scheduled for completion about the middle of 1954.

Benefits from Science Increase

An increasing measure of spiritual and material benefits flowing from the well-springs of science was foreseen on Oct. 11 by Dr. John T. Rettaliata, MWSE, president of Illinois Institute of Technology in Chicago.

"Science assures us of boundless increase for the future. It is a means to fulfilling man's deepest ideals," Dr. Rettaliata declared at a Columbus day banquet in his honor at the Hotel Emerson in Baltimore.

The 42-year-old university president, who was born and educated in Baltimore, was honored by the Italian-American Civic League of Maryland.

The role of the technologist in modern-day life must be understood, he pointed out.

Americans turn out more than half of the world's annual production, he commented. "The primary reason for our high productivity is that it is based on science and technology—science and technology created by the same kind of men who made the atom bomb work."

"Science is feared and misunderstood," he said. "Men say, 'Science has produced the atom bomb and now the hydrogen bomb. Eventually it will bring about civilization's end.'

"To this I say: nonsense. Men who profess these opinions are relatives-in-thought to the men who ridiculed Christopher Columbus.

" 'The world is flat, you'll never come back," they told him. 'Science is figuring out bigger and better ways to kill. We should leave well-enough alone,' they tell us. They are scientific illiterates."

Dr. Rettaliata went on: "Imagine living one day of our present lives without the benefits of the developments of the past 20 years . . . But, more exciting, compare today's life with what you can reasonably expect it to be 20 years in the future."

"Frontiers of 1953 are in science," he said. "The frontiersman is no longer a person in a coonskin cap . . . A trusty rifle is not the instrument he uses in his investigations; instead it may be a slide rule, a balance, or simply a search for truth.

"The primary goals of today's frontiersman are new knowledge and ways of putting this knowledge to work for the benefit of mankind."

"I see science and its advance not as the spectres they temporarily seem to be," he said, "but as forces that are hastening the process of man's moral and spiritual development.

"We can agree that science has wrought means to obliterate man; but we must also agree that it has unchained him to perform loftier tasks, to create better tomorrows," he concluded.

On Training—

Letters from Leaders

In the last issue of Midwest Engineer we published another of about thirty letters received from leaders of Chicago-area firms concerning shortcomings noted in the engineers in their employ. Many of the letters also suggested what the engineers should do to correct their deficiencies.

Significantly, the engineer's technical training is generally considered adequate. In the broad area of Human Relations, however, engineers seem often to be "under achievers," according to the viewpoint of the industrial leaders as reflected in their letters.

We are printing another of these letters in this issue, as we shall do in future issues. Although the letters may be of greatest value to the younger engineers, we hope that all of the engineers who read them will benefit.

Here, then, is the next letter:

Dear Mr. Becker:

I shall attempt to answer your letter of August 31 addressed to Mr. .... inasmuch as he is away from the office. You have asked for a viewpoint on deficiencies in engineers in our employ. The proper answer involves a discussion which is at once critical and perhaps too frank. Nevertheless, over a long period of years, my observation of engineers, particularly in the lower echelon, indicates that they can be characterized as having a narrowness of viewpoint which is probably brought about by their line of thinking. This may be due to constant dealing with facts rather than people. It very often results in intolerance of the views of others in the same organization. Quite often I have observed that a criticism of policy evolved by an engineer is taken as a personal affront rather than an attempt to look at all sides of the question.

I have long sought, in my own mind, a possible remedy and it seems to me that more attention to humanities is indicated. I feel certain if the curricula of engineering colleges were to include more history, economics, public speaking, etc., the student would become well rounded and some of the narrowness of viewpoint might be eliminated. I fully realize that this involves a longer period of training at the university level. The progress of engineering in the last 25 years has resulted in such a mass of new data that it is very difficult to cram everything into a four year course and I feel that a fifth year and perhaps a sixth year would pay dividends in rounding out the individual.

It might be inferred here that these characteristics are peculiar to Engineers. In my observations this is not so. The suggestions I have made for proper rounding out of the educational curricula apply to many other fields as well.

Yours very truly,

Light Measuring Is Economical

Measuring with light results in speed and saving of materials in many fields as varied as steel mills, canning factories and hospitals, Nisson A. Finkelstein, head of the special research department, Bausch and Lomb Optical Company, brought out in an address on Oct. 5 at the fall meeting of The American Society of Mechanical Engineers in Rochester, N. Y. Speaking on the use of optics for engineering measurements, he explained that optical instruments may be divided into those which use light as a tool and those in which light is used as a metric, a fundamental unit of measurement, or a reference axis.

In the first group are hand magnifiers, microscopes, contour projectors, and even the telescope. Their goal is seldom magnification alone, but magnification with increased clarity of detail.

A spectrograph, for instance, is a device "which spreads the light emitted by a substance burned in an arc or spark into an orderly rainbow of its component wave-lengths," he explained. "If a sample of steel alloy is to be analyzed for its composition, it can be used as one electrode in an arc or spark and the light from this source dispersed wavelengthwise in a spectrograph. The resultant spectrum will contain the identifying spectra of each of the alloying elements as well as that of iron, and an analysis of composition can be accomplished.

"Spectrochemical analysis," Finkelstein said, "now plays a leading role in the major industries in this country, often detecting impurities present in amounts on the order of one part per million—topping by many times the speed and accuracy of wet chemical analysis."

As another example of measurement by analysis of emitted radiation, the speaker mentioned the nuclear scintillation counter in which the energy and intensity of nuclear beta ray emissions is obtained by measuring, with a photomultiplier tube, the visible scintillation light of beta rays on crushed moth balls.

Temperature by Color

"One of the best-known applications of optics is measuring the temperature of a hot body or mixture by its color," he said. "The physical principle involved in optical pyrometry is that relating the temperature of a hot body to the wavelengths of radiation emitted by the body at this temperature. This technique is useful in the temperature range of 1000 to 5000 degrees Fahrenheit, maintaining an accuracy on the order of five degrees Fahrenheit."

Spectrophotometry is a technique in which the reflectance or transmission of a material is determined as a function of wavelength. It has been used to control the color of shoe boxes and cigar wrappings, and has been applied to measure the deflectance of living human skin and to the analysis of synthetic vitamins.

Colorimetry, a simplified form of spectrophotometry, is almost universally used in hospitals for blood analysis, bile analysis and the like.

In the paper and paint industries gloss measurement at various angles of

Free Education Is Our Hope

America's best hope for repelling collectivism and assuring the survival of its democratic form of government rests in a system of education free to teach the truth, Dr. John T. Rettaliata, MWSE, president of Illinois Institute of Technology, declared on Oct. 1.

Because of the abiding importance of education, Dr. Rettaliata said, Americans cannot settle for a cursory attitude toward their educational system. Rather, every citizen must take an active part in formulating the policies and promoting the practices of a sound educational program for the benefit of all.

The Illinois Tech president spoke before the combined parents groups of Highland Park, Ill., in the Highland Park high school auditorium.

"In America," he said, "education from the elementary school through the university is a responsibility of every citizen. This is as it should be, for the schools touch the lives of every individual and every family.

Democracy demands an informed citizenry, and it is the task of education to inform. Understanding is impossible without full information, and it is intelligent, sympathetic understanding that we need most in making democracy work."

To maintain and improve our educational system, many problems must be met in the years ahead, Dr. Rettaliata explained. He listed some of these as:

The shortage of trained teachers and the related problem of needed salary increases; a greatly increased school-age population which will require substantial expansion of our schools; and continually rising operating and building costs.

In higher education, Dr. Rettaliata said, the nation faces the prospect of a decreasing percentage of students enrolling in private colleges and universities.

"Our system of higher education traditionally has been one of divided responsibility between public tax-supported institutions on the one hand and privately-supported colleges and universities on the other. Each in its own way has made its contribution to our society," he said.

Americans must now give of their time and effort and financial resources to foster a continued program of privately-supported higher education, Dr. Rettaliata said.

"Every citizen must be forever vigilant," he said, to help maintain the freedom of our universities because research and education, to be worth their salt, must be carried on in an atmosphere of freedom. They cannot be when educators no longer control our colleges and universities."

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illumination and observation is rapidly becoming an important operation.

Control tests of citrus fruit juices, or analysis of crank case oils for insolubles, are effected by microscopic study under illumination, whereas contrasts would not show up under ordinary illumination. Such analyses mean big savings in vats of materials which might otherwise spoil while waiting for the results of the old-time staining technique.

Light As Unit of Measurement

Other applications of optical measurements were described by Finkelstein in which the wavelength of light is used as a unit of measurement. The instrument used for this purpose is the interferometer which operates on the principle that two light waves arriving at a point in such a manner that their wave motions are in phase, combine to produce a bright band or fringe. If they arrive out of phase they will cancel each other, and a dark fringe will be produced.

Interferometry is used mainly to compare an ideal surface with one under test. The National Bureau of Standards has used this technique to detect corrosion to a depth of as little as one to two-millionths of an inch.

Hydraulics Engineers Review Developments

The latest developments in the field of industrial hydraulics were reviewed at the ninth National Conference on Industrial Hydraulics on Oct. 8 and 9 at the Sheraton hotel in Chicago.

The conference was sponsored by Illinois Institute of Technology and Armour Research Foundation of Illinois Tech in an effort to encourage rapid progress in the field of industrial hydraulics through the free exchange of current ideas and developments.

A keynote address was delivered by Dr. John T. Rettaliata, MWSE, Illinois Tech president, on Oct. 8 at a banquet for the delegates in the Grand Ballroom of the Sheraton.

More than 600 delegates from various industries attended the conference.

Tells Industry To Bring Out Best

Calling on industry to bring out the best qualities of the engineers it hires, Carlos E. Harrington, chief engineer, Winsmith, Inc., Springville, New York, speaking at the fall meeting of The American Society of Mechanical Engineers in the Sheraton Hotel in Rochester, N. Y., on Oct. 7, asserted that engineering schools in this country are turning out uniformly well-trained graduates who have a keen appreciation of engineering principles.

A "refresher" lecturer in mechanical engineering under the Engineering Society of Buffalo for the past 16 years, Harrington has worked with hundreds of recent engineering graduates.

Deploring a tendency to let a new engineer become a cog in the machinery of production, from which no one benefits, he said, "To realize that he is being treated fairly and that he cannot better his position by changing employers, leaves the engineer free to concentrate on his particular problems. Management should realize that the engineer thoroughly understands the product he is working with and that his knowledge might be valuable to his competition."

The engineer applies his training in analysis to everything he does. He becomes valuable in fields other than engineering because of his ability to think and reason logically, Harrington brought out. Conferences between engineers themselves, and engineers and management, are necessary in a progressive organization.

The broadening of the engineer by conferences might be extended by his activity in engineering societies, where he can discuss his problems with fellow engineers. "To management this has a sales advantage, because it presents its name to those who, to a great extent, influence purchasing. Aside from the broadening effect on the engineer himself, it acquaints a very select group with the activities and product of his sponsor," Harrington stated.

It's Good To Share!

Be Generous

COMMUNITY FUND of CHICAGO

Helicopter Will Cause Revolution

"During the next 25-50 years, the helicopter will bring about a revolution in air transportation comparable to the upheaval the automobile brought about in surface transportation," Alex L. Hart, New York planning consultant, predicted at the convention of the American Society of Civil Engineers in New York on Oct. 22.

"Heliports need not be located miles out in the country, but can be conveniently located for the people who will use the service. For the first time, air transportation will be able to compete effectively time-wise with all modes of surface transportation for the huge shorthaul intercity market," Hart went on.

In planning facilities in metropolitan areas during the next 10-15 years, said Hart, considerations would be that "helicopter service will be more costly to operate and fares will be higher than other modes of transportation; the helicopter is costly to operate and maintain; indirect costs may not be as high as for present airline service, but they will be higher than for other modes of transportation; shorthaul transportation is more costly and less profitable than long-haul service; 30-50 passenger helicopters will not be able to land on a dime; commercial helicopters may require fairly large areas."

"In the case of the fixed-wing airplane, technological advance has always meant faster aircraft, higher landing speeds and longer runways, resulting in rapid airport obsolescence. It cannot be taken for granted that heliport facilities will not be subject to the same technological obsolescence," he said.

The helicopter, he went on, will serve three distinct travel markets: shorthaul intercity, feeder, and airport.

With development of any sizable volume of express air cargo of the types now carried by truck and railroads precluded by the high cost of helicopter transportation for short distances, Hart said that the principal helicopter traffic will be the movement of people.

"Because helicopter fares will be relatively high, it will be used extensively for business travel where the savings in time will have a real dollar and cents value," said Hart. "Its use for personal travel will be relatively limited because much of personal travel is in family groups where the convenience of the automobile is controlling. The continued expansion of superhighways will further enhance both the speed and convenience of automobile travel, particularly for distances under 200 miles."

Hart believed trunk airlines would operate helicopters for both shorthaul intercity and feeder service. Present local operators, he predicted, "will find the helicopter the answer to their prayer for a shorthaul airplane."

Land values in midtown areas will make heliport construction costly in metropolitan centers, said Hart. Designers will be confronted, he observed, with problems commonly met in city planning. Planners "will have to weigh the effects of noise" and, he went on, "this will be reflected in costs of construction and operation."

Hart cited an estimate by the Port of New York Authority that by 1960 the New York heliports would have an annual patronage of 2,000,000 passengers.

Bell and Gossett and Marlow Merge

The Bell and Gossett Company of Morton Grove, Ill., manufacturers of hot water circulating pumps, universal pumps, heat exchangers, flow control valves and other heating specialties, will merge as of December 1, with Marlow Pumps, Ridgewood, N. J., the world's largest manufacturer of self-priming centrifugal pumps. According to an announcement by A. S. Marlow, Jr., president, the joining of Marlow with Bell and Gossett makes the new combination one of the largest of its type in industry.

Marlow Pumps, with its main plant in Ridgewood, and a branch plant in De Queen, Ark., as well as licensed plants in France and England, will continue its present line under the Marlow name. Additional production capacity will be added in the East to manufacture Bell and Gossett's products. Both product lines retain their individual identity throughout sales, marketing, and distribution.

Under the new set-up, Marlow Pumps will be known as the Marlow Division of Bell and Gossett and will be headed by A. S. Marlow, Jr., as general manager. He will also be a vice president and a member of the board of directors of Bell and Gossett. Founded in 1910, Bell and Gossett is one of the oldest and best known manufacturers in the middle west, and employs some 300 people. Marlow, established in 1926, carries a payroll of approximately 200 which, it is contemplated, will be appreciably increased under the new set-up.

WSE Personals

Dr. Gustav Egloff, MWSE, director of research for Universal Oil Products Co., left on Sept. 28 for Japan, to play a leading role in the 75th anniversary celebration of the Chemical Society of Japan.

Dr. Egloff was the only American to address the Society. As one of three invited foreign lecturers, he spoke on "The Platforming Process" and "Chemicals from Petroleum" at Tokyo and "Catalytic Reactions in Oil Refining" at Osaka during the week of the celebration. Other guest lecturers included Sir Robert Robinson, professor of chemistry, Oxford university, England, and recent recipient of the Priestly Medal of the American Chemical Society, and Dr. Walter Reppe of Germany, noted for his work in acetylene chemistry.

As representative of the American Chemical Society and of the American Institute of Chemists, Dr. Egloff presented their felicitations in the form of honor scrolls at a special ceremony which was held at the Tokyo National Museum on Oct. 29.

While in Japan, Dr. Egloff is scheduled to inspect the installation of UOP Platforming and Fluid Catalytic Cracking units at Japanese refineries. He will also lecture on "Catalytic Cracking" at Tohoku university, Sendai.

While en route to Tokyo, Dr. Egloff stopped in Honolulu on Oct. 1 to speak before the Hawaiian section of the American Chemical Society on "Petrochemicals."

Titus G. LeClair, past president of WSE, and manager of engineering, Commonwealth Edison Co., was one of a panel of experts who discussed "What Are the Industrial Potentialities of Nuclear Power?" on the radio program, "Northwestern Reviewing Stand," on Oct. 25.

Other members of the panel were: Arthur H. Barnes, associate director of the reactor engineering division, Argonne National Laboratory; Donald H. Loughridge, dean, The Technological Institute, Northwestern university, former assistant director of reactor development, Atomic Energy Commission; and J. A. Swartout, deputy director of research, Oak Ridge Institute of Nuclear Studies.

James H. McBurney, dean, The School of Speech, Northwestern university, moderates the Reviewing Stand.

Harry P. Hagedorn, MWSE, engineer of tests, Purchasing department, City of Chicago, spoke on "Academic Aspects of Specification Preparation," at the opening Fall program meeting of the Chicago chapter of the Construction Specification Institute on Oct. 6.

The Gerhardt F. Meyne Co. announces the removal of their offices from 7 South Dearborn st. to Suite 412, 308 W. Washington st., Chicago 6. The telephone number remains FInancial 6-3377.

John J. Ahern, MWSE, director of the department of fire protection and safety engineering at Illinois Institute of Technology in Chicago, addressed the National Safety Congress and Exposition in Chicago on Oct. 22.

John Slezak, MWSE, assistant secretary of the Army, was selected by the Chicago Junior Association of Commerce and Industry to speak at their annual Distinguished Service Awards Dinner on Friday, Nov. 6, at the Palmer House in Chicago at 7 p.m. He is expected to speak on some aspect of Government Policy, most likely in regard to its effect upon his area of jurisdiction.

Slezak is president of the Turner Brass Co., president and chairman of the board of the Pheoll Manufacturing Co., and chairman of the board of the Kable Printing Co. In addition he is director of several companies, including the Illinois Bell Telephone Co., chairman of the board of the Illinois Manufacturers Association, and a trustee of the Illinois Institute of Technology.

An Australian specialist in the minerology of clays has joined the ceramics and minerals staff at Armour Research Foundation of Illinois Institute of Technology, Chicago.

He is Dr. John Alexander Ferguson, who was formerly research officer with the division of building research, Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia. He will hold the rank of full geologist with the Foundation.

Dr. Ferguson holds bachelor's and master's degrees from the University of Queensland, Brisbane, Australia.

He received his Ph. D. degree in geology from the University of Illinois, Urbana, in 1950.

From 1946 to 1948, he was a geologist with the department of coordinator general of public works, Brisbane. He was with the division of building research from 1950 to 1953.

Dr. George Gerard has been appointed assistant director of the Research Division of New York University's College of Engineering, it was announced Oct. 27 by Dr. Harold K. Work, director of the Division. The Research Division, with a staff of 405, has an annual operating rate of more than $2,000,000 in research sponsored by industry and government.

Dr. Gerard has been associated with the College of Engineering since 1947. Before joining the NYU faculty he was principal research engineer in charge of the structure research group at Republic Aviation Corporation.

He received the bachelor and master degrees in aeronautical engineering at NYU's Guggenheim School of Aeronautics in 1943 and 1948 respectively, and was awarded his doctor of engineering science degree by the University in 1950.

The new assistant director is executive secretary of the aviation division of the American Society of Mechanical Engineers and chairman of the subcommittee on structural sandwich construction of the American Society for Testing Materials. He is a member of Tau Beta Pi, honorary engineering fraternity, and of Sigma Xi, science research fraternity.

Dr. Gerard presently directs research at NYU in the development of an impact tube for studying the effect of blast loads on structural elements and in photo-elastic studies of components requiring specialized techniques. He is co-author, with F. R. Steinbacher, of "Aircraft Structural Mechanics" and has written about 20 technical papers.

A British powder metallurgist with seven years' production experience has been appointed to the metals research department staff at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Dr. Arthur G. Metcalfe, former metallurgist with the Deloro Smelting and Refining company, Deloro, Ontario, Canada, will hold the rank of full research metallurgist at the Foundation.

His B. S., M. S., and Ph. D. degrees are from Cambridge university, England. He was with Deloro from 1950 to 1953. From 1942 to 1946, he was a metallurgist with Hard Metal Tools, Coventry, England.

Dr. Metcalfe, who has written various papers on metallurgy, is a member of the American Society for Metals.

A former assistant professor of electrical engineering at Northwestern university has been appointed a full electrical engineer at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Hillard M. Wachowski, a specialist in microwaves, field theory, antennae, and electronics, will work with the communications and radio-frequency applications section of the Foundation's electrical engineering department.

Wachowski received his B. S. degree in 1948; his M. S. in 1950, and his Ph. D. in 1952. All degrees are from Northwestern.

He is a member of the Institute of Radio Engineers, Sigma Xi scientific research fraternity.

Charles F. Murphy, MWSE, partner in the architectural and engineering firm of Naess and Murphy, has been appointed General Chairman of the 1954 Chicago Chapter American Red Cross Fund Campaign.

Murphy is a veteran of two previous Red Cross Fund campaigns. In 1951 he was chairman of the Architects group in the Business division. The following year he was chairman of the Building, Fuel, and Public Utilities section and took the Fund Campaign appeal to 732 companies including 144,500 employees.

The new campaign chairman will head up a volunteer organization of 60,000 men and women who will solicit contributions during the traditional month-long Red Cross appeal next March. Funds contributed each year enable Chicago Chapter of Red Cross to carry out its obligations to hospitalized veterans, for disaster relief and rehabilitation, and many other humanitarian services to the Chicago area communities.

Murphy is President and director of the Insurance Exchange Building Corporation, a director of the Chicago Athletic Association, a director of the Builders Building, and is a trustee of the American School of Fine Arts.

A partner of the firm of Naess and Murphy, he is now actively engaged on the new Prudential Building at Randolph Street facing Grant Park, just east of WSE headquarters.

Daniel V. Terrell has been elected president of the American Society of Civil Engineers, the Society announces. He was installed on Oct. 21 at the annual meeting held in the Statler Hotel in New York. He will serve for one year.

Terrell, of Lexington, Ky., is dean of the College of Engineering, University of Kentucky. He was formerly a director and a vice president of the American Society of Civil Engineers. He was graduated from the University of Kentucky in 1910. He has been on the faculty forty years. Since 1946 he has been dean, and director of the Engineering Experiment Station at Kentucky. For nearly four decades he has been prominent in highway engineering research. Since 1942 Dean Terrell has been director of the Kentucky State Highway Research Laboratory. He also has been a leader in furthering industrial development in Kentucky through research and more effective use of the State's natural resources.

He has served frequently on State and Federal bodies. Dean Terrell has been president of the Kentucky Society of Professional Engineers.

Urges Abatement Promotion

An extended public relations program through amplified advertising would induce wider realization of the need of increased pollution abatement work, the American Society of Civil Engineers, in convention at the Statler Hotel in New York City was advised on Oct. 20 by Morris H. Klegerman, of Alexander Potter Associates, New York consulting engineers.

"The manufacturer who wants to sell his sanitation equipment advertises in technical journals," said Mr. Klegerman. "That's fine as far as it goes, but it does nothing to stimulate the three—or four-fold increase of pollution abatement work necessary if the gap between pollution and abatement is to be narrowed.

"Public recognition of the problem and demand for relief will provide business return for the manufacturer by sheer momentum of its accomplishment. Therefore, his message, worded differently, perhaps also giving recognition to the profession, belongs not in the engineering journals only, but more properly in the newspapers, magazines and weekly news and business journals."

Klegerman suggested that if such a program were too big for the handful of specialized equipment manufacturers in the sanitary engineering field, perhaps it could be supported "by other basic industries, by private foundations concerned with the promotion of the public welfare and by engineer groups or professional societies."

Reviewing the growth of sanitary engineering activities, Klegerman called attention to the fact that the sanitary engineer has "joined the fight for pure air in which hundreds of municipalities have become interested."

"Sewerage, water supply and industrial wastes, in all their divisions, are major aspects of the consulting sanitary engineer's work," said Klegerman.

He said that in sewage treatment alone authoritative estimates "indicate the annual expenditure required for treatment works to meet a proposed 10-year program of pollution abatement from municipal sources alone is $500,000,000. It is further estimated that industrial waste abatement will require an equal sum." He cited a 1951 report of the U. S. Public Health Service that every major river drainage basin in the country requires the construction of new industrial and municipal waste treatment plants, replacements, enlargements or additions.

Philosophy of Zoning May Undergo Change

Chicago's zoning ordinance may be based on a new philosophy soon—that of using performance standards for industrial zoning.

Under the new philosophy, any type of industry would be able to locate in any zone as long as it could meet certain standards.

Armour Research Foundation of Illinois Institute of Technology is completing a $10,000 study for the City Plan Commission to establish standards for possible use in the proposed zoning ordinance.

Dr. Walter C. McCrone, senior chemist at the Foundation, said Chicago is pioneering in the new zoning philosophy, which probably will be the future method of zoning all cities.

Present city ordinances utilize the use-list technique under which industries are listed in the respective zones where they may locate. A weakness of this technique is that it is impossible to make up a complete list of industries.

This is not a sensible way to do the job, Dr. McCrone said, but planners have felt it impossible to do it any other way.

"Now, however, we have a list of nuisances with the speed limits for each that companies must hold to if they plan to locate in the various zones," Dr. McCrone added.

He said the standards have been set up for three manufacturing zones in respect to air pollution, noise, fire hazards, traffic, and even psychological and social factors.

In explaining the standards for air pollution, Dr. McCrone said smoke has been limited on the basis of the Ringelmann smoke scale. Each plant also is limited in terms of the weight of solid matter it can pump out into the atmosphere and the odor it produces.

"Present industries can, with a minimum of changes, meet the requirements for their present zones," McCrone asserted. "In addition, new plants should have no problem meeting requirements for the usual zone and may be able to locate in a better zone."

The new zoning method gives industries an incentive to do better—to want to be in a better zone, Dr. McCrone pointed out.

Armour Research Foundation, which has done extensive air pollution research, will further expand its facilities for such work when it undertakes a $25,000-study for the Midwestern Air Pollution Prevention association.

MAPPA started its campaign to promote financial interest in the proposed study at its fall meeting at the Gary hotel, Gary, Ind., on Oct. 15 and 16. Purpose of the study will be to identify the sources of air pollution in the Chicago area.

The project will cover Cicero, Berwyn, Evanston, Oak Park, Maywood, Elgin, Joliet, East Chicago, Ill., and Gary, Hammond, and Whiting Ind.

Reviews of Technical Books

Alloys

High-Temperature Alloys, by Claude L. Clark, Pitman Publishing Corporation, New York, N. Y. First Edition, 1953. 383 pages. $7.50.

This is a very welcome book in an area that is now of intense interest to many engineers. Designers and engineers are becoming increasingly concerned with the properties of metals at elevated temperatures. As a succinctly presented correlation of the vast amount of data that have been published, Dr. Clark's book supplies a great need. He is eminently qualified as an expert in the field.

The ever increasing temperature requirements of industry are first presented. A short discussion of the mechanism of plastic deformation and the qualifications required of an alloy for high temperature service and the factors influencing performance follow. The various laboratory tests are compared and the significance of the data discussed.

About half of the book is devoted to a discussion of the high temperature properties of the commercially available alloys, from low alloy steels through the various intermediate grades to the super-alloy steels.

The chapter on representative service failures is well illustrated. The book closes with a presentation of the physical properties of steel for high temperature uses, an evaluation of hot-twist test data, a summary of the factors involved in selecting steels for specific service applications, and a resume of the pertinent specifications and codes.

With its many tables and figures the book is a veritable compendium of the great amount of information that has been made available over the past twenty-five years, written by a man who has the unique distinction of being both a pioneer and an active worker in the field. O.Z., W.S.E.

Reinforced Concrete

The Theory and Practice of Reinforced Concrete by Clarence W. Dunham, McGraw-Hill Book Company, New York 36, N. Y. Third Edition, 1953. 499 pages. $7.00.

This new edition of a very useful and well written text has been rewritten and enlarged to include the extensive developments in reinforced concrete in the last fourteen years. Each chapter has been revised to include newly developed material, more illustrative examples, and further and more detailed explanations. Chapters have been added on Forms, Precast Concrete, and Prestressed Concrete.

The chapters on rigid frames and arches that appeared in the earlier edition are omitted from this text. This is a good thing since such material rightfully belongs in a text on indeterminate structure analysis, and also most engineering schools put into separate course work material dealing with analysis on one hand and design on the other. The publishers state that a second volume by the same author will be published on Advanced Reinforced Concrete, which will deal with indeterminate structures and other material intended for graduate students. B.A.W.

Machine Tools

Machine Tool Operation, by Henry D. Burghardt and Aaron Axelrod, McGraw-Hill Book Company, Inc., New York, N. Y. Fourth Edition, 1953. 585 pages. $3.75.

This book has been tailored to fit the needs of the machine-shop apprentice and the student in a vocational or technical school. The experienced machinist may also derive some benefit from the book by using it as a reference material and a refresher, since a number of new machines and their latest attachments are illustrated in it.

The planning of the material in the text by the authors permits flexibility in its use. For example, certain chapters emphasize primarily the operations of the machines, whereas other chapters may be used by the reader as reference material to widen the scope and substantiate the advisability of adopting such machine operations.

Those in need of simple knowledge of the principles and elementary operations of basic machines will derive a benefit from this text. However, it should not be looked upon as an engineering treatise in any sense or a production manual.

The organization of the material as a whole is fair, except at the end of the book where two chapters are referred to as Forge Work. These chapters are 19 and 20. Chapter 19 is dealing with Soldering, Brazing, and Babbitting and should be excluded from Forge Work. Chapter 20 may be included in the category of Forge Work as it stands. It may be suggested that a brief description of Welding would fit in nicely in Chapter 19. S.E.R.

Cellulose

Cellulose—The Chemical That Grows, by William Haynes, Doubleday & Company, Inc., Garden City, New York. 1953. 386 pages. $4.00.

For those engineers, chemists and business men looking for an account of the development of the cellulose and related industries, from its beginnings in the field of explosives to its present highly developed place in the plastics world, this book represents a well written and very easily read contribution.

The style of the author makes for light reading and while the chemistry of cellulose and its derivatives has been treated in an elementary fashion, the historical picture remains clear. Thirty pages of appendices summarize a vast quantity of industrial and engineering data which the cellulose industrialist will find of great value.

In all, it may be said that the picture painted is like a good after-dinner speech, fascinating in its color, informative in its detail, yet amusing in its wealth of anecdotes.

B.R.

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C-1357(b) PLATING CHEMIST — Chem. Eng. Age: up to 50. 3 plus yrs. exp. in electro plating, synthetics and nitrocellulose lacquers. Duties: control of solutions for plating on copper zinc alloys, silver and other metals. For a manufacturer of novelties. Salary: $6000-$8000. Employer will negotiate fee. Loc.: Western Chicago suburb.

C-1357 (c) CERAMIC ENGINEER — Ceramics 3 plus yrs. exp. in ceramics work. Knowledge of cloisonne enamels and stylizing. Duties: install and operating processes and production on metal and plastic products finished with transparent ceramics. For a manufacturer of novelties. Salary: $7000-9000 per yr. Employer will negotiate fee. Loc.: West Chicago suburb.

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Automation is a mechanical cycle of movements, which duplicate each other and insure steady peak production, and reduce scrap, rejects, rework and touch-up. It will produce uniform quality. It results in safety advantages, reduces inventory in process, relieves congestion of aisles and floor space. It reduces damage to product between operations, reduces fatigue of operators. Many items of automation equipment can be charged off as expendable tools.

Automation produces steady, peak production and reduces cost, both of which are of paramount importance to our economy, with lower cost commodities within reach of many more people, resulting in greater consumption, which requires increased production and further expansion of facilities and equipment.

Small plants, as well as large plants, can benefit by automation.

A variety of items, through the same process in job shop lots, lend themselves to automation benefits.

Select the conveyor which adapts itself to the manipulation movements required, and don't try to make one type conveyor do all operations.

Design for sturdy construction to eliminate vibration, excessive wear for better alignment, and positioning.

Do not crowd into too small a space, or try to make movement too abrupt.

Limits, escapements, etc., should be protected from shock and, when possible, allow for over-travel.

Have movements ample to eliminate micrometer adjustments which will result in lower first cost of equipment, and give longer life.

Select most suitable type power or energy to perform manipulation necessary, and select simple controls in order to reduce cost and maintenance.

If first appropriations are not enough, go to management for additional funds to permit ample design for successful operation.

Approach automation with an open mind. Rearrange sequence of operations, if necessary. Provide new fixtures or change old fixtures to simplify manipulation or positioning of parts.

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